A Proposal for an Interdepartmental Program of Graduate Studies in Biophysics for the M.S. and Ph.D. Degrees

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Executive Summary

An interdepartmental graduate program in the field of Biophysics is proposed, justified on the basis of the intrinsic importance of the field in the life sciences and the growing number of faculty at UC Riverside who are presently working in the area as broadly defined. The intent is to provide a means to recruit and train a new cadre of graduate students to UCR that will complement existing graduate programs on campus and provide trainees for the research programs of the participating faculty. Areas of existing expertise on campus include macromolecular structure determination, spectroscopic methods of various sorts, photosynthesis, physiological ecology and ecosystem processes, computational/mathematical modeling of biological systems, biological electron transfer, neurobiophysics and protein engineering. Formal course requirements will consist of a core curriculum and electives that amount to approximately one full academic year of coursework, and will be comprised of existing classes. Training in professional integrity and the responsible conduct of research will be explicit components of the curriculum. Basic requirements for the M.S. Plan II degree will consist of successful completion of the coursework and passing a Comprehensive Examination prepared and graded by the participating faculty. For the Ph.D. degree, in addition to the requirements for the M.S. Plan II degree, students will be expected to complete a Qualifying Examination consisting of the preparation and defense of a research proposal based on their dissertation research and prepared in the format of a regular grant proposal to the National Science Foundation or National Institutes of Health. Upon successfully completing the Qualifying Examination, Ph.D. students will be expected to complete an independent research project under the direction of a three-member dissertation committee chaired by a faculty member in the Program who will serve as the student’s dissertation advisor. The dissertation advisor will be responsible for direction of the research, including providing an appropriate environment and other resources required to undertake the research. The Dissertation Committee will provide general guidance in the course of research, and be responsible for administering the final oral defense of the dissertation arising from the research, which will consist of a public presentation of the principal findings of the research followed by a private defense of the dissertation.

The Program will be administered by a Director and a three-member Executive Committee. The members of the Executive Committee will be responsible for graduate admissions, graduate oversight and curriculum, with each chairing a standing committee comprised of two additional participating faculty members from the Program. The Director, in conjunction with an administrator from the CNAS Graduate Student Affairs Center, will be responsible for the day-to-day operation of the program, including admissions, student advising and monitoring students’ progress through the Program.
Section 1. Introduction

1.1) Aims and objectives of the program. The objectives of the proposed interdepartmental graduate program are to provide graduate training leading to the M.S. and Ph.D. degrees in Biophysics, and to promote teaching and research in the field of Biophysics by students and faculty at the University of California, Riverside. Biophysics is a major area of study and research in the life sciences, and attracts a considerable number of students. Biophysicists are needed by institutions of higher learning, and by federal, state and private research organizations in order to fulfill their respective missions. UC Riverside has considerable strength in the area of Biophysics, but this strength has a relatively low level of national visibility given the broad dispersal of the faculty working in the area on campus and the absence of a cohesive training environment.

1.2) Historical development of the field. Biophysics as an academic discipline arose in the mid-19th Century out of studies by a group of German physicians and physiologists whose work focused on various aspects of electrophysiology and sensory stimulus, which in turn had grown out of the earlier work of Galvani and Volta. By the mid-20th Century, a formal Biophysical Society had been created in the US as an outgrowth of the American Physiological Society, and the Biological Physics Division of the American Physical Society had been established. At this time the discipline had grown to encompass a great many areas of research utilizing a variety of physical methods to study biological phenomena, as well as computational modeling of same. Examples include: structural biology, spectroscopy, electrophysiology, bioenergetics and biomechanics, neural networks, single-molecule dynamics, theoretical biology and a wide range of computational methods. Today the combined membership of the Biophysical Society and the APS Division of Biological Physics includes over 10,000 scientists, a large and thriving intellectual community. Here at UC Riverside, there has been significant investment in faculty hiring in the area of biophysics in several departments, and an undergraduate track in Biophysics already exists as part of the BS major in Physics. A number of graduate and undergraduate courses are in place in the Physics and Astronomy Department, as well as the departments of Biochemistry and Chemistry. Significantly, substantial expertise already exists on campus in areas recognized as lying within Biophysics, including: macromolecular structure determination, spectroscopic methods of various sorts, photosynthesis, physiological ecology and ecosystem processes, biological electron transfer, computational/mathematical modeling of biological systems, neurobiophysics and protein engineering. The departments Biochemistry, Chemistry and Physics and Astronomy have all made multiple hires in the area of biophysics over the past few years, and the rapid growth of the biophysics community has provided the impetus for the creation of a graduate program in Biophysics. The proposed program will be essential to maximize the growth and vigor of the research programs of both existing and future faculty at UC Riverside working in the area.

1.3) Timetable for development of the program. Upon approval of the Program, a Director will be appointed by the Dean of the Graduate Division and the program’s standing committees established as described in Section 8 below. A website describing the new program and the research interests of its participating faculty will be created to advertise the program, and graduate admissions will commence, focusing on Ph.D. applicants. We anticipate a graduate admission rate of 5-10 students per year over the first several years of the Program, and 5-15 thereafter. Assuming an average matriculation-to-graduation time of 4.5 to 5 years, the Program will eventually grow to approximately 45 students. Given the significant amount of faculty recruitment in Biophysics that has taken and continues to take place on campus, the number of participating faculty is expected to grow, which may well lead to even more rapid growth of the Program. Table 1 provides a timetable for anticipated Ph.D. enrollment.
Table 1

<table>
<thead>
<tr>
<th>Year of program</th>
<th>new students min-max</th>
<th># graduating</th>
<th>cumulative min-max</th>
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<tr>
<td>1</td>
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<tr>
<td>5</td>
<td>5-15</td>
<td>5-10</td>
<td>20-45</td>
</tr>
</tbody>
</table>

1.4) Relation of the proposed program to existing programs and to the Campus Academic Plan.

Biophysics is inherently interdisciplinary, and the proposed program will effectively complement existing graduate programs in the Departments of Biochemistry, Chemistry and Physics and Astronomy. The majority of participating faculty also come from these academic units, and the proposed Program will provide them with a new source of trainees to participate in their individual research programs. The intent is to create a mechanism for the recruitment of a cadre of graduate students interested in studying and training in biophysics that would not otherwise have considered UC Riverside. For this reason, it is to be expected that there will be negligible negative impact on existing programs on campus. The proposed program is also consistent with the growth of the graduate student population at UC Riverside anticipated by the Graduate Division, and former Dean Joe Childers was specifically enthusiastic about the creation of the program. A major focus of the Campus Academic Plan is growth of UC Riverside’s research portfolio (particularly the NIH-supported component), and achieving AAU accreditation. Much of the field of biophysics in fact has immediate biomedical relevance, and creation of a Biophysics Program is thus fully aligned with the Campus Academic Plan. Graduate programs are the engine of the research enterprise in the laboratory sciences, and creation of a graduate program in Biophysics can be expected to facilitate the development of new and expanded research programs by the participating faculty. Creation of the program is also justified by the significant level of faculty recruitment in the area at UC Riverside over the past several years in several departments, with a critical mass of faculty now having been achieved. Indeed, a major impetus for the creation of the program was the insufficiently large pool of graduate students available to the participating faculty, particularly junior faculty eager to establish their laboratories. Additional faculty growth in the area of biophysics is a specific component of the strategic plans for (minimally) the departments of Biochemistry, Chemistry and Physics, and the demand for graduate students will only increase in future. As part of this growth, and consistent with UC Riverside’s Strategic Plan, the program is committed to diversity, both in the participating faculty as the home departments of the participating faculty recruit and in the demographic make-up of the graduate students accepted into the program. The campus’s nationally recognized standing as an institution committed to developing and sustaining a pipeline of underrepresented minorities and women in STEM disciplines will be leveraged to ensure a diverse academic community in biophysics.

1.5) Interrelationship of the program with other UC institutions.

Biophysics programs at other UC campuses fall into two principal groups; Berkeley, Davis and San Francisco have interdepartmental graduate programs in Biophysics similar to that being proposed here, while Los Angeles, Santa Barbara, Santa Cruz and San Diego have competing tracks or sections in both their Physics and Chemistry/Biochemistry Departments. Additionally, Irvine has a Department of Physiology and Biophysics in its School of Medicine, and Merced has a Biophysics track in the Ph.D. program of its Department of Physics. Given the distribution of the participating faculty at UC Riverside, the interdepartmental graduate program model seen at Berkeley, Davis and San Francisco is considered the more appropriate for UC Riverside, and the solicited letters from the Directors of the
interdepartmental graduate programs at both Berkeley and Davis are very supportive (see Appendix III); clearly, there is no perceived concern regarding competition between campuses. Indeed, given the important role of Biophysics in the biological sciences, all research universities involved in graduate training in the biological sciences would be well served by providing a degree program in biophysics. UC Riverside is no exception.

1.6) **Administration.** As described in detail in Section 8 below, the Program will be administered by a Director and a three-member Executive Committee. The members of the Executive Committee will be responsible for Graduate Admissions, Graduate Oversight and Curriculum, with each chairing a standing committee comprised of two additional participating faculty members from the Program. The Director, in conjunction with an administrator from the CNAS Graduate Student Affairs Center, will be responsible for the day-to-day operation of the program, including admissions, student advising and monitoring students’ progress through the Program. The Graduate Student Affairs Center presently oversees the administration of 16 graduate programs, and the addition of one more does not significantly increase the workload of its staff. Indeed, a staff member has already been assigned to take responsibility for the proposed program. The Chair of the Graduate Oversight Committee will serve as graduate advisor and will be responsible for administering the Cumulative Examination, which will consist of questions provided by the participating faculty.

1.7) **Plan for evaluation of the program.** In the first two years, the participating faculty will self-evaluate the graduate program prior to the normal third-year review to be conducted by Graduate Council that is required for all new graduate programs at UC Riverside. Thereafter, the program will be evaluated by an external team of experts every 6-7 years, as is the standard practice the Graduate Division at UC Riverside.

**Section 2. Program Description**

2.1) **Undergraduate preparation for admission.** Students admitted to the Biophysics Graduate Program will be expected to have completed a bachelor’s degree in Biochemistry, Biology, Chemistry or Physics (or related fields) at an accredited 4-year college or university, and to have attained an undergraduate academic record that meets or exceeds the standards established by the Graduate Division of UC Riverside. Students will have completed coursework in chemistry (minimally, one year each of introductory and organic, including laboratories), physics (minimally, one year introductory, including laboratory), mathematics (minimally, one year calculus, plus one upper division course), biochemistry (minimally, one year introductory, including laboratory) and biology (minimally, one year introductory, including laboratory) in addition to upper-division courses in their major. Students with strong academic records may be admitted with coursework deficiencies, provided these are remediated during the first two years of graduate study. Entry into the program will require adequate performance on the Graduate Record Examination (GRE), as well as the Subject Examination in Physics, Chemistry, Biochemistry or Biology.

2.2) **Foreign language competency.** None required.

2.3) **Program of study.**

2.3a) **Specific fields of emphasis.** The program will offer a Master’s (M.S.) Plan II and a doctoral (Ph.D.) degree in Biophysics. Students enrolled in the program are expected to complete core coursework consisting of a one-year (three quarter) series of graduate coursework. Students are also expected to participate in seminars and colloquia, and to become informed about the major technological methods and advances that provide the
essential underpinnings to new discoveries in the field. Upon entry, each student will work with the program’s Graduate Oversight Committee to develop an appropriate course of study given the student’s interests, including the assignment of laboratory rotations (tentatively BPHY 297) with three different participating faculty as part of the preceptor selection process.

2.3b) Plans. M.S. Master’s students will complete core coursework in biophysics, and will take at least one graduate seminar course each quarter that they are enrolled. They must take and pass a Comprehensive Examination at the end of their coursework. Ph.D. Doctoral students will be expected to fulfill all requirements for the M.S. degree; the expectation for satisfactory performance on the Comprehensive Examination will be higher than for the M.S. degree. Doctoral students must also pass a combined written and oral Qualifying Examination consisting of: (1) the preparation of a research proposal based on the student’s dissertation work and taking the form of a grant proposal to NSF or NIH; and (2) defense of same before a faculty committee consisting of a Chair and three additional program faculty, plus one external member to ensure fairness (see Section 2.5 below). The student will also undertake a research project leading to a dissertation, with annual presentations to the dissertation committee to assess progress toward degree. Publications in peer-reviewed journals are also expected. In the course of their studies, Ph.D. students will be expected to complete a minimum of two quarters as teaching assistant to gain experience in instruction.

2.3c) Unit requirements. M.S. 36 units of 100 or 200 series courses, of which at least 18 units must be in the graduate 200 series. This coursework will include the program’s graduate core curriculum and courses from a list of approved electives (see Section 5). Ph.D. 36 units of 100 or 200 series courses, of which at least 24 units must be in the graduate 200 series. This coursework will include the program’s graduate core curriculum and courses from a list of approved electives (see Section 5). A minimum of 16 units of coursework other than courses in the 290 series must be completed in fulfillment of the 24-unit program requirement for graduate coursework.

2.3d) Required and recommended courses. All students will be required to take a three-quarter sequence of introductory biophysics (consisting of BCH 184, BIOL 203 and PHYS 246), as well as a series of four five-week research rotations in laboratories of participating faculty under the auspices of BPHY 297, as part of the thesis advisor selection process. Participation in the Biophysics Graduate Seminar (tentatively BPHY 252) is also required each quarter that the student is enrolled, and each student is expected to present a formal research seminar in this course prior to graduation. Students will also be required to complete the Responsible Conduct of Research program provided by the Office of Research Integrity. To complete the 36 unit requirements for degree, students will select courses from a list of approved electives to meet unit requirements (see Section 5).

2.3e) Comprehensive Examination. Both Master’s and doctoral students will be required to pass a three-hour Comprehensive Examination consisting of questions provided by the participating faculty, with topics taken from the core curriculum. The Comprehensive Examination will be graded by those submitting questions, and the results presented to the participating faculty for a decision of PhD Pass, MS Pass, or Fail in each student’s case. The expectation for satisfactory performance on the Comprehensive Examination will be higher for doctoral students than for Master’s students.
2.3f) **Licensing/certification requirements.** None.

**Professional development and training** – The program of study described above incorporates a number of aspects that contribute to the professional development and training of the program’s graduate students. These include:

- The written component of the General Examination, which is intended to provide experience in the preparation of grant proposals to be submitted to federal granting agencies;
- The oral component of the General Examination, the requirement for an annual research evaluation and requirement to present in BPHY 252, which provide the opportunity to develop presentation skills that will complement those developed in research group meetings and journal clubs that the student may participate in;
- The TA requirement, which includes participation in the Teaching Assistant Development Program administered by the Graduate Division of UC Riverside, which is intended to develop pedagogical skills; and
- Involvement in the Office of Research Integrity’s Responsible Conduct of Research program, which is intended to reinforce a strong sense of professional ethics.
- Participation in national and international scientific conferences, providing the opportunity to develop presentation skills and personal networking opportunities.
- Participation in professional development programs run by organizations such as The Department of Education, the National Science Foundation, the National Institutes of Health, the American Association for the Advancement of Science, the Association of Women in Science, the Biophysical Society and the Biological Division of the American Physical Society.

2.4) **Field examinations.** None.

2.5) **Ph.D. Qualifying Examination.** Doctoral students must pass a written qualifying examination that, as indicated above, will consist of the preparation of a research proposal based on their dissertation work and taking the form of a grant application to the National Science Foundation or National Institutes of Health. The proposal will be evaluated by an Oral Qualifying Exam committee consisting of a participating faculty member selected by the Director in consultation with the student’s dissertation advisor and three additional program faculty selected by the student and his/her preceptor, and approved by the Program Director. All members of the Oral Qualifying Examination Committee must be members of the Academic Senate, and the Committee will include one external examiner whose principal is to ensure the fairness of the examination; for a total of five committee members. The Committee will not include the student’s dissertation advisor. Once the written proposal is deemed satisfactory by the Committee, the student must pass an oral examination that will consist of a defense of the written research proposal before the student’s Qualifying Examination committee. Upon successful completion of all coursework and passing of the Qualifying Examination, the student will advance to Candidacy.

2.6) **Thesis and/or dissertation.** Having completed the four required laboratory rotations in BPHY 297 in their first year, students will be expected to have selected a dissertation advisor by the end of their first academic year. The student’s dissertation advisor will chair a Ph.D. Dissertation Committee that will consist of a minimum of two additional members of the Academic Senate, who will normally also be participating members of the Biophysics Graduate Program. All committee members should be able to provide guidance and judge the scholarship of the dissertation
research. The student is expected to meet with his/her Dissertation Committee once a year in an Annual Research Evaluation, in which the student formally presents his/her work to date and progress is assessed and input to the research project provided by the committee. During this time, students will be enrolled in sufficient credits of directed research (tentatively BPHY 299) to ensure good standing in the Graduate Division. A written dissertation will be completed by each student in the program.

2.7) *Final examination.* Doctoral candidates will defend their dissertations in a public, oral presentation at a time announced to members of the University community. The public presentation will be followed by a private defense of the dissertation to the Dissertation Committee, which will make a recommendation to the Graduate Division as to whether the degree of Ph.D. should be conferred.

2.8) *Explanation of special requirements.* None.

2.9) *Relationship of M.S. and Ph.D. programs.* Students will normally be admitted to the Ph.D. program. Upon passing the Qualifying Examination and advancement to Candidacy, the student may petition the Graduate Division for conferral of the M.S. degree.

2.10) *Special preparation for careers in teaching.* Not applicable.

2.11) *Sample Ph.D. program.* Students enrolled in the proposed program will be expected to complete an individualized curriculum that will include the core coursework described in Section 2.3d above, with additional coursework tailored to the student’s research interests and background (including remediation of deficiencies identified upon admission to the program). Table 2 provides a sample program designed to meet the needs of a student wishing to work in the area of structural biology, with an emphasis in protein structure determination as elucidated by NMR.

Table 2

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<th>Fall</th>
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<tr>
<td>Year 1</td>
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<td>BPHY 252 (Seminar)</td>
<td>BPHY 252 (Seminar)</td>
</tr>
<tr>
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</tr>
<tr>
<td></td>
<td>Elective</td>
<td>Elective</td>
<td>Elective</td>
</tr>
<tr>
<td>Year 2</td>
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<td>CHEM 229Q (Advanced NMR)</td>
<td>BCH 210 (Bch Macromol)</td>
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<td></td>
<td>BPHY 297 (Research)</td>
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</tr>
<tr>
<td>Years 3-5</td>
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<td>BPHY 252 (Seminar)</td>
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</tr>
<tr>
<td></td>
<td>BPHY 299 (Dissertation Research)</td>
<td>BPHY 299 (Dissertation Research)</td>
<td>BPHY 299 (Dissertation Research)</td>
</tr>
</tbody>
</table>

2.12) *Normative time from matriculation to degree.* A typical doctoral student will be expected to complete all degree requirements in approximately five years.
Section 3. Projected Need

3.1) Student demand for the program. The National Research Council recognizes Biochemistry, Biophysics and Structural Biology as major disciplines in the Life Sciences, and specifically ranks Ph.D. programs in these areas. Biophysics and Computational Biology is also a major section of Proc. Natl. Acad. Sci. (USA), emphasizing its importance as a discipline. Significant breakthroughs over the past decade in protein structure determination and a variety of imaging methodologies, new insights into the dynamic behavior of individual protein molecules and advances in understanding the relationship of structure to function (in systems ranging from nitrogen fixation and photosynthesis to the replisome and signal transduction) have brought great attention to Biophysics. These advances in turn have attracted students eager to participate in such discoveries. At the same time, a wide range of career opportunities await individuals trained in biophysics, including positions in the pharmaceutical and chemical industries, academia and both public and private research institutions. The proposed graduate program will provide a coherent, campus-wide umbrella organization under which faculty efforts and resources can be marshaled, faculty and student interactions and research/grant productivity facilitated, and the overall reputation of the campus in the field enhanced. This will then generate even greater interest among potential students who will be attracted to the program. While students interested in the research programs of the participating faculty are already entering one or another existing departmental graduate program, a formal interdepartmental program will provide prospective students with greater educational and training opportunities and be of greater interest to students specifically seeking a degree in Biophysics. Again, the expectation is that the proposed program will attract a cadre of students who would not otherwise consider coming to UC Riverside and is not expected to have a negative impact on existing graduate programs. It will also address a significant manpower need on the part of the research programs of present and future faculty working in the area. As indicated above, the program is committed to the development of a diverse graduate student population that will contribute to the campus, indeed national, priority of developing an increasingly robust pipeline of under-represented minorities and women in STEM disciplines.

3.2) Opportunities for placement of graduates. There is high demand for biophysicists in a broad range of areas. The development of new drugs in the pharmaceutical industry is increasingly guided by the detailed three-dimensional structures of therapeutic targets (e.g., reverse transcriptases, viral coat protein maturases, membrane channel proteins) and by the modeling of their dynamic behavior and interaction with potential drugs. Similarly, the chemical industry has become increasingly invested in the use of individual enzymes and even entire metabolic pathways in the development of more efficient methods to produce a wide range of commodity and fine chemicals. The US National Laboratories have had a long-standing and strategic interest in the application of sophisticated physical methods to understand biological systems and processes, as have private research institutions such as the Scripps Research Institute and Howard Hughes Medical Institute. Finally, recruitment of biophysicists has become a priority in academia nationwide, and particularly in biomedically relevant areas. This national trend is reflected in recent faculty recruitment at UC Riverside in the Departments of Biochemistry, Bioengineering and Chemistry, and to a lesser extent the Department of Physics. There is every reason to believe that students receiving a Ph.D. in Biophysics from UC Riverside will have excellent job prospects.

3.3) Importance to the discipline. Biophysics is an inherently interdisciplinary enterprise, with strong components drawn from Physics, Biochemistry, Mathematics and Chemistry, as well as other life sciences. Having a Ph.D. program that will provide a coherent training program to students across disciplinary lines will provide students with an exceptionally broad perspective that will make them
extremely well-qualified to contribute at the cutting edge of modern research in the area. The broad
disciplinary distribution of participating faculty in the proposed program will greatly contribute to the
breadth of training provided at UC Riverside.

3.4) Ways in which the Program will meet societal needs. Over the past 50 years, many of the
most important advances in our understanding of the processes of life have been made by
biophysicists. Signal contributions include: discovery of the atomic-resolution structure of DNA;
elucidation of the genetic code and mechanism of information transfer in biological systems; structure
of the ribosome, photosynthetic and nitrogen-fixation systems; behavior of individual molecules of the
replisome, topoisomerase, helicase and other complex enzymatic systems working on DNA; the
physical basis of transmembrane ion transport, particularly as relates to neuronal function; and
visualization/analysis of neural networks. These and other advances have contributed enormously to
our understanding of various disease states, including cancer and heart disease, and to the
improvement of human health. Students in the proposed Biophysics Program will be able to
participate in either basic or applied research in these and other emerging areas and thus contribute to
a deeper understanding biological processes and to improved human health. And to reiterate, the
program is committed to the development of a diverse graduate student population that will contribute
to the national priority of developing an increasingly robust pipeline of under-represented minorities
and women in STEM disciplines.

3.5) Relationship of the Program to research interests of the faculty. Many faculty members at
UC Riverside are engaged in biophysics-related research, including a significant number of new hires
in the Departments of Biochemistry, Chemistry and Physics. The participating faculty are spread
across five different departments, and an interdepartmental graduate program such as proposed will
provide an effective and much-needed mechanism for facilitating productive interactions among the
participating faculty and for generating an enriched training environment for its students.

3.6) Program differentiation. Most UC campuses have graduate programs in biophysics (UC
Irvine has a Department of Physiology and Biophysics in its School of Medicine), and a biophysics
program on each campus is easily justified in light of the information provided in Sections 3.1 - 3.5
above. The strongly supportive letters from the Directors of the interdepartmental graduate programs
in Biophysics at Berkeley and Davis (Appendix III) attest to the lack of perceived competition with
existing programs at other UC campuses. The proposed program is distinctive in the range of specific
physical methods employed by its participating faculty as well as the breadth of the particular
biological systems and processes under investigation, factors which combine to provide a unique
training environment. In addition, UC Riverside's nationally recognized leadership in the education of
under-represented minorities will provide the proposed program with opportunities to contribute to the
STEM pipeline.

Section 4. Faculty
The 27 participating faculty in the proposed Biophysics Graduate Program are self-identified from
among five departments in the College of Natural and Agricultural Sciences; of these eight are women
and eleven are minority. Each has a significant component of biophysics in his or her research
program. Detailed curricula vitae are provided in Appendix I, and individual letters of participation in
Appendix II. Letters from the Chairs of the Departments of Biochemistry, Biology, Botany and Plant
Sciences, Chemistry and Physics and Astronomy are provided in Appendix III, along with letters from
the Directors of interdepartmental graduate programs at UC Berkeley, UC Davis and UC San
Francisco. Letters of support from the Dean of CNAS can be found in Appendix IV, and a memorandum from the Executive Committee of CNAS in Appendix V.

**Biochemistry**

- Gregor Blaha (Assistant Professor, Ph.D.)
- Richard Debus (Professor, Ph.D.)
- Li Fan (Associate Professor, Ph.D.)
- Russ Hille (Distinguished Professor, Ph.D.)
- Seán O’Leary (Assistant Professor, Ph.D.)
- Jeff Perry (Assistant Professor, Ph.D.)
- Jikui Song (Assistant Professor, Ph.D.)

**Biology**

- Richard Cardullo (Professor, Ph.D.)
- Theodore Garland (Distinguished Professor, Ph.D.)
- Nicole Rafferty (assistant Professor, Ph.D)

**Botany and Plant Sciences**

- Darrel Jenerette (Associate Professor, Ph.D.)
- Dawn Nagel (Assistant Professor, Ph.D.)
- Carolyn Rasmussen (Assistant Professor, Ph.D.)
- Louis Santiago (Associate Professor, Ph.D.)

**Chemistry**

- Huiwang Ai (Assistant Professor, Ph.D.)
- Chia-en Chang (Associate Professor, Ph.D.)
- Joseph Genereux (Assistant Professor, Ph.D.)
- Richard Hooley (Associate Professor, Ph.D.)
- Ryan Julian (Professor, Ph.D.)
- Len Mueller (Professor, Ph.D.)
- Yinsheng Wang (Professor, Ph.D.)
- Min Xue (Assistant Professor, Ph.D.)
- Wenwang Zhong (Professor, Ph.D.)

**Physics**

- Mark Alber (Distinguished Professor, Ph.D.)
- John Barton (Assistant Professor, Ph.D., arriving 1/1/18)
- Umar Mohideen (Professor, Ph.D.)
- Roya Zandi (Professor, Ph.D.)

### Section 5. Courses

No new didactic courses are required to implement the proposed program, although new Biophysics Seminar (tentatively BPHY 252), Research Rotation (tentatively BPHY 297) and Dissertation Research (tentatively BPHY 299) courses will need to be established. Three existing courses, BCH 184 (Physical Biochemistry, 4 units), BIOL 203 (Cellular Biophysics, 3 units) and PHYS 246 (Biophysics, 4 units each) will constitute the core curriculum for the proposed program. Syllabi for these three courses along with their catalog descriptions are provided in Appendix VI. Additional elective courses appropriate for the program include:

- BCH 186 (Topics in Molecular Bioenergetics, 3 units)
- BCH 187 (Fundamentals of Enzymology, 3 units)
- BCH 210 (Biochemistry of Macromolecules, 4 units)
- BCH 230F (Advanced Topics in Biochemistry: Enzymology)
- CHEM 201A (Advanced Physical Chemistry: Quantum Mechanics, 3 units)
- CHEM 201B (Advanced Physical Chemistry: Quantum Mechanics and Spectroscopy, 3 units)
- CHEM 201C (Advanced Physical Chemistry: Elementary Statistical Mechanics, 3 units)
CHEM 201D (Advanced Physical Chemistry: Thermodynamics, 3 units)
CHEM 201E (Advanced Physical Chemistry: Kinetics, 3 units)
CHEM 206A (Introduction to Computational Quantum Chemistry, 3 units)
CHEM 206B (Modeling Chemical and Biochemical Molecules, 3 units)
CHEM 209M (Introduction to NMR, 3 units)
CHEM 211D (Spectrometry in Organic Structure Analysis, 3 units)
CHEM 229Q (Advanced NMR, 3 units)
PHYS 145ABC (Biophysics, 4 units each)
PHYS 212A (Thermodynamics and Statistical Mechanics I, 4 units)
PHYS 212B (Thermodynamics and Statistical Mechanics II, 4 units)

Catalog descriptions of the above courses are provided in Appendix VII. All courses are currently offered, (some in alternate years), and all are currently staffed. New elective courses can be added upon approval as described in Section 8.

Section 6. Resource Requirements

6.1) **FTE faculty.** No additional faculty positions are sought, although new or replacement positions awarded to departments with participating faculty in the proposed program can reasonably be expected to expand the program over time. The process for admitting new faculty to the program is described in Section 8, in Article II.1 of the by-laws. Administrative support will be provided by the Graduate Student Affairs Center of CNAS, which presently administers 16 graduate programs; as indicated above one staff member has already been identified to work with the proposed program. Support for the Director will be provided by CNAS commensurate with that provided other Directors of interdepartmental graduate programs (e.g., Cell, Molecular and Developmental Biology; Genetics, Genomics and Bioinformatics; Environmental Toxicology), as described in the letters provided by CNAS Dean Uhrich and Divisional Deans Umar Mohideen (Physical Sciences and Mathematics) and Frances Sladek (Life Sciences) (Appendix IV).

6.2) **Library acquisition.** The UCR library system, in particular the Science Library, currently subscribes to all the major journals relevant to Biophysics, and also purchases the important books, monographs and the like in the field. No increase in demand for new acquisitions is anticipated.

6.3) **Computing costs.** No increases in computing costs are anticipated beyond those associated with UC Riverside’s projected growth in faculty and research portfolio, as laid out in the campus’s Strategic Plan. Personal computer facilities are available in the laboratories of all the participating faculty, providing access to the Internet. The computer facilities of the Science Library are also available to student and participating faculty of the program. More advanced computing capabilities are available in the laboratories of several of the participating faculty, who also have access to off-campus supercomputing facilities as needed.

6.4) **Equipment.** No new equipment is required to implement the proposed program, although one of the expected benefits accruing from its creation is that greater interaction among laboratories will identify common equipment needs for which extramural funds will be sought. While institutional matching funds are typically required of granting agencies in making such awards, these are usually modest relative to the total cost of the instrumentation. As a particular example, plans are being made for the submission of a proposal for a 900 MHz NMR instrument that will be used by several of the participating faculty of the proposed program, to be housed in space already available in the Chemical Sciences Building.
6.5) **Space and other capital facilities.** None, although again plans are being made for the submission of a proposal for a 900 MHz NMR instrument that will be used by several of the participating faculty of the proposed program, to be housed in specifically designed space already available in the Chemical Sciences Building. Additional space may be made available in the MRB1 building that is presently under construction, scheduled for completion at the end of 2018.

6.6) **Other operating costs.** As indicated above, support for the Director of the proposed program will be provided by CNAS, consistent with its policies as outlined in the Deans’ letters (Appendix IV). Additionally, administrative services will be provided by the CNAS Graduate Student Affairs Center as discussed above. Again, this Center already provides administrative support for 16 graduate programs, and the proposed program does not substantively increase its workload. A staff member of the Center has already been identified to serve the proposed program.

**Section 7. Graduate Student Support**

Graduate students in the proposed program will be supported by a combination of sources. Support in the first year will be provided by fellowships through the Graduate Division, and creation of the program is consistent with the Graduate Division’s projected growth of graduate fellowships as the number of UCR faculty grows. In consultation with the Graduate Division, former Dean Childers was enthusiastic about creation of the program. At the end of the first year students will have selected a dissertation advisor and will typically be supported thereafter as research assistants on grants awarded to their dissertation advisors, individual pre-doctoral fellowships from federal granting agencies and private foundations, and/or teaching assistantships provided either by the home department of the student’s dissertation advisor or through the Teaching Assistantship Allocation Committee (TAAC), which makes assignments for all graduate programs in the Life Sciences. The TAAC has a strong track record of providing support for graduate students in 16 different graduate programs, specifically including successful interdepartmental graduate programs such as Cell, Molecular and Developmental Biology and Genetics, Genomics and Genomics. While the Graduate Division has no formal requirement for 301/302-level coursework to provide training in becoming a teaching assistant, biophysics students holding teaching assistantships in departments that require 301/302 coursework will take them. As laid out in the Deans’ letters provided in Appendix IV, the CNAS leadership is strongly committed to ensuring continuous funding for all the program’s students in good academic standing throughout their time in the proposed program as described in. It is to be emphasized that CNAS has demonstrated an outstanding track record to support for graduate students that is clearly articulated in the Deans' letters in Appendix IV and is far more specific than letters of support for past proposals for the creation on interdepartmental graduate programs (e.g., GGB, CMDB and Materials Science). Students in the proposed program can thus expect to have the benefit of appropriate support from the college.

**Section 8. Governance**

The Program will be administered by a Director and a three-member Executive Committee. The Director, in conjunction with an administrator from the CNAS Graduate Affairs Center, will be responsible for the day-to-day operation of the program, including admissions, student advising and monitoring students’ progress through the Program. The members of the Executive Committee will chair subcommittees for Graduate Admissions, Graduate Oversight and Curriculum, with each subcommittee comprised of two additional participating faculty members from the Program.

The proposed graduate program will be governed by the following by-laws:
Article I. Objective

The proposed Biophysics Graduate Program is intended to encourage broad-based study of and post-graduate training in biophysics and to foster communication between biophysicists within different departments on the UC Riverside campus. The Program is thus intended to be interdepartmental, and includes some 27 faculty from the departments of Biochemistry, Biology, Botany and Plant Sciences, Chemistry and Physics. The program’s primary objective is to train scientists able to teach and conduct research in the area of biophysics. The proposed Biophysics Program will offer both a M.S. and a Ph.D. in Biophysics.

Given the departmental distribution of the biophysics community on campus, graduate students will have the opportunity to incorporate a wide range of disciplines into their training experience. Programs of study will be tailored to the interests and goals of individual students.

Article II. Membership

1) Membership Criteria. The participating faculty recognize that involvement in a graduate program can take many forms, although the principal one is obviously training of graduate students in the field as broadly defined. Criteria for membership can include 1) maintenance of an active research program in the area of biophysics as broadly defined; 2) service on graduate student General Examination and Dissertation Committees; 3) continued participation in the Biophysics program by emeritus faculty, and 4) support of research endeavors in the field of biophysics by non-Academic Senate members. Approval of new members to the Biophysics program will be vested in the Executive Committee. Faculty requesting membership in the Biophysics Program should send a curriculum vitae to the Graduate Program Director with a cover letter describing how the candidate expects to be involved in the program. The Director will then forward the documents to the Executive Committee for consideration. With a favorable review, an e-mail vote of the participating faculty will be taken; membership will be conferred with a positive vote by a majority of the responding faculty.

2) Membership Retention. The membership status of Biophysics faculty will be reviewed every three years by the Executive Committee. Criteria used to evaluate members can include serving as a major professor or as a member of advisory, candidacy exam or supervisory committees for Biophysics graduate students; service on committees of the Biophysics Program; attendance at seminars; participation in recruitment activities and other Biophysics Program functions. Faculty whose membership is to be evaluated will be notified in Fall of the academic year and may be asked to supply a brief summary of their Biophysics-related activities to the Executive Committee by the end of the Fall quarter. The Executive Committee will complete its evaluations by the end of Winter quarter of the same academic year.

3) Termination of Membership. A participating faculty member who wishes to leave the program may request termination of their membership at any time by sending a memo to the Program Director. Program members whose participation is deemed below that sufficient for good standing will be reviewed by the Executive Committee to determine the source of any problems and to recommend solutions. Members will be given a year to improve their participation in the Biophysics Program before facing termination.

Article III. Organization and Administration

As indicated above, the administration of the program and its activities will be vested in an Executive Committee consisting of three program members in addition to the Biophysics Program Director, who will serve as chair. Each of these will chair one of the three standing committees of the Program: Recruitment and Admissions, Graduate Oversight and Curriculum, with the responsibilities described below.
1) **Program Director.** The Graduate Program Director will be responsible for the overall direction and organization of the Biophysics Program and will chair the Executive Committee. The appointment of the Program Director will be in keeping with the regulations of Graduate Council. Initially, the Dean of the Graduate Division will solicit nominations from the program faculty and make an appointment. Afterwards, the Executive Committee will solicit confidential nominations from the participating faculty and submit the names of no more than two qualified faculty to the Dean of the Graduate Division, along with a supporting statement for each nominee. The Dean of the Graduate Division will then forward his/her final nominee to the Chancellor, who will make the actual appointment of the new Program Director. The Biophysics Program Director will be the Biophysics representative at CNAS chairs meetings and other meetings on campus requiring representation of the program. The Biophysics Program Director will send nominations of faculty to serve as Graduate Advisor to the Dean of the Graduate Division as well as nominations of faculty to serve as chairs of the program’s standing committees. The Biophysics Program Director will appoint additional members to these standing committees (see below).

2) **Chair, Recruitment and Admissions.** The chair of the Recruitment and Admissions committee will be responsible for recruiting students to the Program and assessing the files of applicants to the program. The Recruitment and Admissions Chair will be nominated by the Biophysics Program Director, with final approval given by the Dean of the Graduate Division.

3) **Chair, Graduate Oversight.** The chair of the Graduate Oversight Committee will serve as Graduate Advisor and will be responsible for the overall academic advising of students in the Biophysics Program. S/he will be responsible for revisions of the Graduate Student Handbook and will be responsible for setting up faculty rotation schedules for first-year graduate students. S/he will also be responsible for advising students as to forming their Qualifying Examination and Dissertation Committees, and will have responsibility of the Program’s annual Comprehensive Examination. The Dean of the Graduate Division will give final approval of the Qualifying Examination and Dissertation Committees. As Graduate Advisor, the chair of the Graduate Oversight Committee will be nominated by the Biophysics Program Director, with final approval given by the Dean of the Graduate Division.

4) **Chair, Curriculum.** The chair of the Curriculum Committee will oversee the assessment of the Program curriculum and implementation of changes in same, as described further below. With his/her committee, s/he will also have overall responsibility for organizing the Program’s seminar series. The Recruitment and Admissions Chair will be nominated by the Biophysics Program Director, with final approval given by the Dean of the Graduate Division.

**Article IV. Committees**

1) **Executive.** The administration of the program and its activities will be vested in an Executive Committee consisting of four members: Biophysics Program Director who will serve as chair, and the chairs of the program’s three standing committees. The Executive Committee will act in an advisory capacity to the Program Director for any issues that arise concerning the Biophysics Program and will be responsible for review and approval of new faculty to the Biophysics program and for final decisions on termination of membership. The Executive Committee will also facilitate the process used to nominate new Program Directors. It will meet at least once per year, more frequently as needed.

2) **Recruitment and Admissions.** The Recruitment and Admissions Committee will be responsible for recruitment activities and review of applications of students who wish to enter the Biophysics Program. This committee will send files of qualified applicants, along with supporting documentation, to the Graduate Division Dean, who will make the final decision regarding admission and Graduate Division fellowship support. The Recruitment and Admissions Committee
will also coordinate the recruitment visits of admitted graduate students to UCR, oversee the maintenance of the program website and prepare advertising/recruitment materials for the program.

The Recruitment and Admissions Committee will consist of the committee Chair from the Executive Committee plus two participating faculty members appointed by the Director, and will meet as necessary to review files and plan recruitment activities. The term of membership on the Admissions Committee will be three years.

3) Graduate Oversight. The Graduate Oversight Committee will be responsible for overseeing students’ progress through the program, and will assist the Chair of the committee in forming students’ Qualifying Examination and Dissertation Committees, and in the preparation of the Program’s annual Comprehensive Examination.

The Graduate Oversight Committee will consist of the committee Chair from the Executive Committee plus two participating faculty members appointed by the Director, and will meet as necessary to undertake its responsibilities. The term of membership on the Admissions Committee will be three years.

4) Curriculum. The Curriculum Committee will be responsible for assessment of and changes to the curriculum of the Biophysics program, and will make recommendations for such changes to the curriculum as are deemed appropriate, including the addition of new elective courses, to the participating Biophysics faculty during a Biophysics faculty meeting. A subsequent e-mail vote will be held to approve or disapprove the recommended changes. In order to be considered approved, at least 51% of the participating program faculty must vote in favor of the changes to the program curriculum. The Curriculum Committee will also be responsible for administering the Program’s seminar series, selecting and hosting speakers and planning program retreats or research symposia. The Curriculum Committee will meet at least once per year.

The Curriculum Committee will consist of the committee Chair from the Executive Committee plus two participating faculty members appointed by the Director, and will meet as necessary to undertake its responsibilities. The term of membership on the Admissions Committee will be three years.

**Article V. Changes to the By-Laws**

Changes to the by-laws of the program will be considered at a meeting of the participating faculty, and a subsequent e-mail vote will be held to approve or disapprove the proposed changes. In order to be considered approved, at least 51% of the participating program faculty must vote in favor of the changes to the program’s by-laws.

**Section 9. Changes in Senate Regulations**

No changes in Academic Senate Regulations are required.
Appendices

I. Faculty CV's

II. Faculty Letters of Participation

III. Departmental Chair and Program Director Letters

IV. Letters from CNAS Dean

V. CNAS Executive Committee memo

VI. Syllabi for Core Courses

VII. Course Catalog Descriptions of Elective Courses
Graduate Council

November 21, 2017

To: Dylan Rodriguez, Chair
Riverside Division

From: Christiane Weirauch, Chair
Graduate Council

Re: Revised Biophysics Proposal

Graduate Council reviewed the revised Biophysics proposal at their November 16, 2017 meeting. The Council is very supportive of this new program but would like clarification on the following items:

- TAships – explicitly listing TAAC as a mechanism to secure TAships for students in this interdepartmental program is a strength, but it would be good to explore potential buy-in from departments and to mention this in the proposal.

- Please specify the number of required lab rotations in the proposal. This information is useful for students and prevents confusion.

- Section 2.3d: “Students will also be required to complete the Responsible Conduct of Research program provided by the Graduate Division”: it is unclear what this “program” entails, given there is no detail on the corresponding webpage. Please be more specific.

- Professional Development (PD): clarify the last bullet point (“Responsible Conduct of Research program”). As per current catalog copy PD training is explained as “Training typically includes elements of research and professional ethics, grant and professional writing, strategies for success in graduate school and the profession, pedagogy, public speaking, career and job market guidance, and other relevant topics to help students become successful professionals.” The currently listed requirements are integral parts of a graduate program, but PD requirements would ideally address additional training aspects and be more rigorous.
October 20, 2017

To: Dylan Rodriguez, Chair
Riverside Division

From: Jiayu Liao
Committee on Library and Information Technology

Re: [Campus Review] New Graduate Program Proposal: Revised Biophysics Interdepartmental Graduate Program

The Committee on Library and Information Technology reviewed the [Campus Review] New Graduate Program Proposal: Biophysics Interdepartmental Graduate Program at their October 19, 2017 meeting and voted to support the program. Although it was noted in the proposal that there will be no increase in demand for new library acquisitions and no increases in computing costs, the committee believes that if this new program brings new faculty and students to campus, this will need to be re-evaluated as more computer support and dedicated lab space will be needed.
PLANNING & BUDGET

December 21, 2017

To: Dylan Rodriguez, Chair
    Riverside Division

From: Christian Shelton, Chair
      Committee on Planning and Budget

RE: Revised Biophysics Proposal

P&B discussed the revised proposal for a graduate program in Biophysics and feels that the issues the committee raised last year have been addressed and resolved. The revised proposal makes it clear how this program fits into UCR's plans to increase the size of graduate programs.

Separately, P&B noted that the current difficulties of budgetary support for interdisciplinary programs remain. This is not unique to this proposal and does not stand in the way of P&B's support of the Biophysics proposal.

Yet, some of the issues raised in the last round of review were mitigated in the current proposal by the reduction of the proposal to a single college.

For the first cycle of review by Graduate Council, P&B suggests that potential problems with interdisciplinary funding be paid special attention to.
July 22, 2017

To the University Senate:

Please find attached a revised proposal to create an interdepartmental graduate program in Biophysics at UCR, the original version having been submitted December 21, 2016. In their reviews of the original proposal, both Graduate Council and the Senate Committee on Budget and Planning expressed support for the proposed graduate program, but each had concerns that warranted the present revision. These concerns, and the responses to them, are summarized below.

Graduate Council expressed concern regarding funding of the program, and asked for additional information regarding compensation for the program Director and overall support for the program. There was also a general statement made regarding faculty diversity. Regarding diversity, a second round of solicitations to participate has been circulated, and of the 27 faculty now participating in the revised proposal, seven are women and eleven are minority, a significant improvement.

Regarding support for the program, new wording in Sections 1.6, 6.1, 6.6 and the Introduction to Section 8 emphasizes that the proposed program will be administered by the CNAS Graduate Affairs Center, which presently provides administrative services for 16 departmental and interdepartmental graduate programs. The proposed program represents only a modest increase in the Center’s workload, and a member of the Center’s staff has already volunteered to serve the proposed program.

By far the most substantive change to the proposal has been the removal of ten faculty in BCOE, with all remaining 27 participants being in CNAS. This was necessitated in response to concerns expressed by Graduate Council, which specifically stated:

“Given the campus-wide nature of the program, the Council feels that funding should be defined and commitments outlined at inception. This could involve discussion and commitment among the deans of the various colleges (who have all indicated support of the proposal), or perhaps funding of these programs could be best managed at the provost level. Either way, budget support should be determined in detail, including provisions for future expansions, before the program begins.”

In attempting to address this concern, Deans Kathryn Uhrich of CNAS and Sharon Walker of BCOE met in early July to discuss a joint response. At the end of the day, Dean Walker made clear that while she fully supported the creation of the proposed program she was not prepared to make any specific financial commitment to it. Given the express concerns of Graduate Council, this decision has necessitated dropping BCOE participants so that all participating faculty are now from CNAS. I personally find this unfortunate, but Graduate Council has clearly articulated its concerns and there is simply no other way forward. I observe that with 27 participants, the revised proposal remains well above critical mass and retains broad programmatic depth.

To address the concerns expressed by Graduate Council, a second letter from the CNAS Dean and Divisional Deans of the Life Sciences and Physical Sciences and Mathematics has been provided in Appendix IV, and as indicated there and in modified wording to Sections 6.1 and 6.6, compensation for the Program Director will be provided by the CNAS Dean’s office in a manner consistent with college policy, as described in the letter. This letter also clearly articulates the Deans’ commitment to provide a level of support appropriate to ensure the success of the proposed program, including the allocation of teaching assistantships for program students through the TA Allocation Committee.
responsible for assigning TAs for all the Life Science graduate programs. This commitment represents a level of support comparable to that enjoyed by other interdepartmental graduate programs in the Life Sciences, including Cellular, Molecular and Developmental Biology, and Genetics, Genomics and Bioinformatics, which by any measure must be considered very successful. I trust this second letter of support from CNAS satisfactorily addresses the concerns raised by Graduate Council.

The Committee on Budget and Planning voted unanimously in support of the program, but commented on the need for the proposed curriculum to comply with Graduate Division requirements regarding 301/302-level coursework and requested additional information concerning the relationship of the proposed graduate program to existing ones and how teaching assistantships would be allocated for program students. Regarding the 301/302-level coursework, it is to be noted that Graduate Division has no formal requirements for these courses, which provide department-specific training for prospective teaching assistants. Section 7 has been expanded, however, to include a statement that program students seeking teaching assistantships should comply with departmental requirements for such coursework in order to be eligible.

Regarding the relationship of the proposed program to existing ones, Section 1.4 has been substantially expanded to emphasize the point made in the original proposal that the intent is to complement rather than duplicate or compete with existing graduate programs, and specifically to recruit a cadre of students seeking study and training in biophysics who would not have otherwise considered UC Riverside. The Committee specifically asked the question “how will faculty in biophysics be able to increase their total number of mentored graduate students without additional faculty lines?”, which seems to suggest that the program can only grow at the expense of others, and that the number of participating faculty and the size of their research programs is static. Suffice it to say that the research programs of the participating faculty are substantially under-staffed at present, a situation that has been a major impetus for proposing the new graduate program in the first place. It is further to be emphasized that the number of faculty working in the area of biophysics has been rapidly expanding, with 12 of the participating faculty hired in the last two years. Three additional hires have been approved in the coming year in Biochemistry, Chemistry and Physics and there is every reason to believe this expansion will continue for the foreseeable future. While these hires are not required for the success of the proposed program, they do underscore how timely the present proposal is. The demand for graduate students working in the area is only expected to increase and there is every reason to believe that the participating faculty will be able to accommodate the anticipated increase in graduate students accruing from the program’s growth, as projected in Section 1.3. Creation of the proposed graduate program is also fully consistent with the projected growth of the Graduate Division as the size of the faculty expands.

Finally, the Committee requested additional information regarding the allocation and administration of teaching assistantships for the program’s students. In response, Section 7 has been expanded considerably to address this and, as referred to above, a new letter from the CNAS Dean has been provided in Appendix IV that clearly articulates their commitment to providing teaching assistantships and other resources sufficient to ensure the success of the proposed program.

In addition to these specific responses to points raised by Graduate Council and the Committee on Budget and Planning, a number of stylistic changes have been made throughout the proposal and two egregious grammatical mistakes have been corrected. These are not enumerated.

In conclusion, I would like to thank both Graduate Council and the Committee on Budget and Planning for their thoughtful critiques of the original proposal. I look forward to learning of final disposition of the revised proposal.

Sincerely,

Russ Hille
Distinguished Professor of Biochemistry
December 21, 2016

University Senate
University of California, Riverside

Dear Colleagues:

I attach for your consideration a proposal to create an interdepartmental graduate program in Biophysics at UC Riverside. The 31 participating faculty represent seven departments in two colleges, and collectively reflect the full breadth of biophysics as presently practiced internationally.

In addition to the body of the proposal, including an executive summary, seven appendices are included containing the following:

• CV’s of participating faculty
• letters of participation form the participating faculty
• letters from the seven departmental chairs at UCR as well as letters from the directors of two existing interdepartmental graduate programs at UC Berkeley and UC Davis
• letters of support from the Deans of CNAS and BCOE
• memoranda of approval from the Executive Committees of CNAS and BCOE
• syllabi for the proposed core curriculum
• catalog descriptions of the proposed elective courses

I submit the following names as suggested internal and external examiners:

Wendy Salzman, Department of Biology, UCR  michelle.salzman@ucr.edu
Mary Droser, Department of Earth Sciences, UCR  mary.droser@ucr.edu
Jay Gan, Department of Environmental Sciences, UCR  j.gan@ucr.edu
Howard Judelson, Department of Plant Pathology & Microbiology, UCR  howard.judelson@ucr.edu
Jory Yarmoff, Department of Physics, UCR  jory.yarmoff@ucr.edu

David Britt, Department of Chemistry, UC Davis  rdbritt@ucdavis.edu
Carlos Bustamante, Department of Physics, UC Berkeley  carlos@alice.berkeley.edu
Alison Butler, Department of Chemistry, UC Santa Barbara  butler@chem.ucsb.edu
Susan Miller, Department of Pharmaceutical Chemistry, UC San Francisco  Susan.MillerPhd@ucsf.edu
Tom Poulos, Department of Biochemistry, UC Irvine  poulos@uci.edu

Thank you for your consideration, and I look forward to hearing back from you in due course.

With best regards,

Russ Hille, Ph.D.
Distinguished Professor of Biochemistry
A Proposal for an Interdepartmental Program of Graduate Studies in Biophysics for the M.S. and Ph.D. Degrees

Prepared September 14, 2016; revised August 22, 2017

Contact Information
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Distinguished Professor
Department of Biochemistry
2404B Boyce Hall
ph. 823-6354
e-mail russ.hille@ucr.edu

Executive Summary

An interdepartmental graduate program in the field of Biophysics is proposed, justified on the basis of the intrinsic importance of the field in the life sciences and the growing number of faculty at UC Riverside who are presently working in the area as broadly defined. The intent is to provide a means to recruit and train a new cadre of graduate students to UCR that will complement existing graduate programs on campus and provide trainees for the research programs of the participating faculty. Areas of existing expertise on campus include macromolecular structure determination, spectroscopic methods of various sorts, photosynthesis, physiological ecology and ecosystem processes, computational/mathematical modeling of biological systems, biological electron transfer, neurobiophysics and protein engineering. Formal course requirements will consist of a core curriculum and electives that amount to approximately one full academic year of coursework, and will be comprised of existing classes. Training in professional integrity and the responsible conduct of research will be explicit components of the curriculum. Basic requirements for the M.S. Plan II degree will consist of successful completion of the coursework and passing a Comprehensive Examination prepared and graded by the participating faculty. For the Ph.D. degree, in addition to the requirements for the M.S. Plan II degree, students will be expected to complete a Qualifying Examination consisting of the preparation and defense of a research proposal based on their dissertation research and prepared in the format of a regular grant proposal to the National Science Foundation or National Institutes of Health. Upon successfully completing the Qualifying Examination, Ph.D. students will be expected to complete an independent research project under the direction of a three-member dissertation committee chaired by a faculty member in the Program who will serve as the student’s dissertation advisor. The dissertation advisor will be responsible for direction of the research, including providing an appropriate environment and other resources required to undertake the research. The Dissertation Committee will provide general guidance in the course of research, and be responsible for administering the final oral defense of the dissertation arising from the research, which will consist of a public presentation of the principal findings of the research followed by a private defense of the dissertation.

The Program will be administered by a Director and a three-member Executive Committee. The members of the Executive Committee will be responsible for graduate admissions, graduate oversight and curriculum, with each chairing a standing committee comprised of two additional participating faculty members from the Program. The Director, in conjunction with an administrator from the CNAS Graduate Student Affairs Center, will be responsible for the day-to-day operation of the program, including admissions, student advising and monitoring students’ progress through the Program.
Section 1. Introduction

1.1) Aims and objectives of the program. The objectives of the proposed interdepartmental graduate program are to provide graduate training leading to the M.S. and Ph.D. degrees in Biophysics, and to promote teaching and research in the field of Biophysics by students and faculty at the University of California, Riverside. Biophysics is a major area of study and research in the life sciences, and attracts a considerable number of students. Biophysicists are needed by institutions of higher learning, and by federal, state and private research organizations in order to fulfill their respective missions. UC Riverside has considerable strength in the area of Biophysics, but this strength has a relatively low level of national visibility given the broad dispersal of the faculty working in the area on campus and the absence of a cohesive training environment.

1.2) Historical development of the field. Biophysics as an academic discipline arose in the mid-19th Century out of studies by a group of German physicians and physiologists whose work focused on various aspects of electrophysiology and sensory stimulus, which in turn had grown out of the earlier work of Galvani and Volta. By the mid-20th Century, a formal Biophysical Society had been created in the US as an outgrowth of the American Physiological Society, and the Biological Physics Division of the American Physical Society had been established. At this time the discipline had grown to encompass a great many areas of research utilizing a variety of physical methods to study biological phenomena, as well as computational modeling of same. Examples include: structural biology, spectroscopy, electrophysiology, bioenergetics and biomechanics, neural networks, single-molecule dynamics, theoretical biology and a wide range of computational methods. Today the combined membership of the Biophysical Society and the APS Division of Biological Physics includes over 10,000 scientists, a large and thriving intellectual community. Here at UC Riverside, there has been significant investment in faculty hiring in the area of biophysics in several departments, and an undergraduate track in Biophysics already exists as part of the BS major in Physics. A number graduate and undergraduate courses are in place in the Physics and Astronomy Department, as well as the departments of Biochemistry and Chemistry. Significantly, substantial expertise already exists on campus in areas recognized as lying within Biophysics, including: macromolecular structure determination, spectroscopic methods of various sorts, photosynthesis, physiological ecology and ecosystem processes, biological electron transfer, computational/mathematical modeling of biological systems, neurobiophysics and protein engineering. The departments Biochemistry, Chemistry and Physics and Astronomy have all made multiple hires in the area of biophysics over the past few years, and the rapid growth of this community has provided the impetus for the creation of a graduate program in Biophysics. The proposed program will be essential to maximize the growth and vigor of the research programs of both existing and future faculty at UC Riverside working in the area.

1.3) Timetable for development of the program. Upon approval of the Program, a Director will be appointed by the Dean of the Graduate Division and the program’s standing committees established as described in Section 8 below. A website describing the new program and the research interests of its participating faculty will be created to advertise the program, and graduate admissions will commence, focusing on Ph.D. applicants. We anticipate a graduate admission rate of 5-10 students per year over the first several years of the Program, and 5-15 thereafter. Assuming an average matriculation-to-graduation time of 4.5 to 5 years, the Program will eventually grow to approximately 45 students. Given the significant amount of faculty recruitment in Biophysics that has taken and continues to take place on campus, the number of participating faculty is expected to grow, which may well lead to even more rapid growth of the Program. Table 1 provides a timetable for anticipated Ph.D. enrollment.
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1.4) *Relation of the proposed program to existing programs and to the Campus Academic Plan.* Biophysics is inherently interdisciplinary, and the proposed program will effectively complement existing graduate programs in the Departments of Biochemistry, Chemistry and Physics and Astronomy. The majority of participating faculty also come from these academic units, and the proposed Program will provide them with a new source of trainees to participate in their individual research programs. The intent is to create a mechanism for the recruitment of a cadre of graduate students interested in studying and training in biophysics that would not otherwise have considered UC Riverside. For this reason, it is to be expected that any negative impact on existing programs will be negligible. The proposed program is also consistent with the growth of the graduate student population at UC Riverside anticipated by the Graduate Division, and former Dean Joe Childers was specifically enthusiastic about the creation of the program. A major focus of the Campus Academic Plan is growth of UC Riverside’s research portfolio (particularly the NIH-supported component), and achieving AAU accreditation. Much of the field of biophysics in fact has immediate biomedical relevance, and creation of a Biophysics Program is thus fully aligned with the Campus Academic Plan. Graduate programs are the engine of the research enterprise in the laboratory sciences, and creation of a graduate program in Biophysics can be expected to facilitate the development of new and expanded research programs by the participating faculty. Creation of the program is also justified by the significant level of faculty recruitment in the area at UC Riverside over the past several years in several departments, with a critical mass of faculty now having been achieved. Indeed, a major impetus for the creation of the program was the insufficiently large pool of graduate students available to the participating faculty, particularly junior faculty eager to establish their laboratories. Additional faculty growth in the area of biophysics is a specific component of the strategic plans for (minimally) the departments of Biochemistry, Chemistry and Physics, and the demand for graduate students will only increase in future.

1.5) *Interrelationship of the program with other UC institutions.* The majority of Biophysics programs at other UC campuses fall into two groups: Berkeley, Davis and San Francisco have interdepartmental graduate programs in Biophysics similar to that being proposed here, while Los Angeles, Santa Barbara, Santa Cruz and San Diego have competing tracks or sections in both their Physics and Chemistry/Biochemistry Departments. Additionally, Irvine has a Department of Physiology and Biophysics in its School of Medicine, and Merced has a Biophysics track in the Ph.D. program of its Department of Physics. Given the distribution of the participating faculty at UC Riverside, the interdepartmental graduate program model seen at Berkeley, Davis and San Francisco is considered the more appropriate for UC Riverside, and the solicited letters from the Directors of the interdepartmental graduate programs at both Berkeley and Davis are very supportive (see Appendix III); clearly, there is no perceived concern regarding competition between campuses. Indeed, given the important role of Biophysics in the biological sciences, all research universities involved in graduate training in the biological sciences would be well served by providing a degree program in biophysics. UC Riverside is no exception.
1.6) **Administration.** As described in detail in Section 8 below, the Program will be administered by a Director and a three-member Executive Committee. The members of the Executive Committee will be responsible for Graduate Admissions, Graduate Oversight and Curriculum, with each chairing a standing committee comprised of two additional participating faculty members from the Program. The Director, in conjunction with an administrator from the CNAS Graduate Student Affairs Center, will be responsible for the day-to-day operation of the program, including admissions, student advising and monitoring students’ progress through the Program. The Graduate Student Affairs Center presently oversees the administration of 16 graduate programs, and the addition of one more does not significantly increase the workload of its staff. Indeed, a staff member has already volunteered to take responsibility for the proposed program. The Chair of the Graduate Oversight Committee will serve as graduate advisor and will be responsible for administering the Cumulative Examination, which will consist of questions provided by the participating faculty.

1.7) **Plan for evaluation of the program.** In the first two years, the participating faculty will self-evaluate the graduate program prior to the normal third-year review to be conducted by Graduate Council that is required for all new graduate programs at UC Riverside. Thereafter, the program will be evaluated by an external team of experts every 6-7 years, as is the standard practice the Graduate Division at UC Riverside.

**Section 2. Program Description**

2.1) **Undergraduate preparation for admission.** Students admitted to the Biophysics Graduate Program will be expected to have completed a bachelor’s degree in Biochemistry, Biology, Chemistry or Physics (or related fields) at an accredited 4-year college or university, and to have attained an undergraduate academic record that meets or exceeds the standards established by the Graduate Division of UC Riverside. Students will have completed coursework in chemistry (minimally, one year each of introductory and organic, including laboratories), physics (minimally, one year introductory, including laboratory), mathematics (minimally, one year calculus, plus one upper division course), biochemistry (minimally, one year introductory, including laboratory) and biology (minimally, one year introductory, including laboratory) in addition to upper-division courses in their major. Students with strong academic records may be admitted with coursework deficiencies, provided these are remediated during the first two years of graduate study. Entry into the program will require adequate performance on the Graduate Record Examination (GRE), as well as the Subject Examination in Physics, Chemistry, Biochemistry or Biology.

2.2) **Foreign language competency.** None required.

2.3) **Program of study.**

2.3a) **Specific fields of emphasis.** The program will offer a Master’s (M.S.) Plan II and a doctoral (Ph.D.) degree in Biophysics. Students enrolled in the program are expected to complete core coursework consisting of a one-year (three quarter) series of graduate coursework. Students are also expected to participate in seminars and colloquia, and to become informed about the major technological methods and advances that provide the essential underpinnings to new discoveries in the field. Upon entry, each student will work with the program’s Graduate Oversight Committee to develop an appropriate course of study given the student’s interests, including the assignment of laboratory rotations (tentatively BPHY 297) with three different participating faculty as part of the preceptor selection process.
2.3b) Plans. **M.S.** Master’s students will complete core coursework in biophysics, and will take at least one graduate seminar course each quarter that they are enrolled. They must take and pass a Comprehensive Examination at the end of their coursework. **Ph.D.** Doctoral students will be expected to fulfill all requirements for the M.S. degree; the expectation for satisfactory performance on the Comprehensive Examination will be higher than for the M.S. degree. Doctoral students must also pass a combined written and oral Qualifying Examination consisting of: (1) the preparation of a research proposal based on the student’s dissertation work and taking the form of a grant proposal to NSF or NIH; and (2) defense of same before a faculty committee consisting of a Chair and three additional program faculty, plus one external member to ensure fairness (see Section 2.5 below). The student will also undertake a research project leading to a dissertation, with annual presentations to the dissertation committee to assess progress toward degree. Publications in peer-reviewed journals are also expected. In the course of their studies, Ph.D. students will be expected to complete a minimum of two quarters as teaching assistant to gain experience in instruction.

2.3c) **Unit requirements.** **M.S.** 36 units of 100 or 200 series courses, of which at least 18 units must be in the graduate 200 series. This coursework will include the program’s graduate core curriculum and courses from a list of approved electives (see Section 5). **Ph.D.** 36 units of 100 or 200 series courses, of which at least 24 units must be in the graduate 200 series. This coursework will include the program’s graduate core curriculum and courses from a list of approved electives (see Section 5). A minimum of 16 units of coursework other than courses in the 290 series must be completed in fulfillment of the 24-unit program requirement for graduate coursework.

2.3d) **Required and recommended courses.** All students will be required to take a three-quarter sequence of introductory biophysics (consisting of BCH 184, BIOL 203 and PHYS 246), as well as a series of research rotations in laboratories of participating faculty under the auspices of BPHY 297, as part of the thesis advisor selection process. Participation in the Biophysics Graduate Seminar (tentatively BPHY 252) is also required each quarter that the student is enrolled, and each student is expected to present a formal research seminar in this course prior to graduation. Students will also be required to complete the Responsible Conduct of Research program provided by the Graduate Division. To complete the 36 unit requirements for degree, students will select sufficient courses from a list of approved electives to meet unit requirements (see Section 5).

2.3e) **Comprehensive Examination.** Both Master’s and doctoral students will be required to pass a three-hour Comprehensive Examination consisting of questions provided by the participating faculty, with topics taken form the core curriculum. The Comprehensive Examination will be graded by those submitting questions, and the results presented to the participating faculty for a decision of PhD Pass, MS Pass, or Fail in each student’s case. The expectation for satisfactory performance on the Comprehensive Examination will be higher for doctoral students than for Master’s students.

2.3f) **Licensing/certification requirements.** None.

**Professional development** – The program of study described above incorporates a number of aspects that contribute to the professional development of the program’s graduate students. These include:
• The written component of the General Examination, which is intended to provide experience in the preparation of grant proposals to be submitted to federal granting agencies;

• The oral component of the General Examination, the requirement for an annual research evaluation and requirement to present in BPHY 252, which provide the opportunity to develop presentation skills that will complement those developed in research group meetings and journal clubs that the student may participate in;

• The TA requirement, which includes participation in the Teaching Assistant Development Program administered by the Graduate Division of UC Riverside, which is intended to develop pedagogical skills; and

• Involvement in the Graduate Division’s Responsible Conduct of Research program, which is intended to reinforce a strong sense of professional ethics.

2.4) Field examinations. None.

2.5) Ph.D. Qualifying Examination. Doctoral students must pass a written qualifying examination that, as indicated above, will consist of the preparation of a research proposal based on their dissertation work and taking the form of a grant application to the National Science Foundation or National Institutes of Health. The proposal will be evaluated by an Oral Qualifying Exam committee consisting of a participating faculty member selected by the Director in consultation with the student’s dissertation advisor and three additional program faculty selected by the student and his/her preceptor, and approved by the Program Director. All members of the Oral Qualifying Examination Committee must be members of the Academic Senate, and the Committee will include one external examiner whose principal is to ensure the fairness of the examination, for a total of five committee members. The Committee will not include the student’s dissertation advisor. Once the written proposal is deemed satisfactory by the Committee, the student must pass an oral examination that will consist of a defense of the written research proposal before the student’s Qualifying Examination committee. Upon successful completion of all coursework and passing of the Qualifying Examination, the student will advance to Candidacy.

2.6) Thesis and/or dissertation. Having completed laboratory rotations in BPHY 297 in their first year, students will be expected to have selected a dissertation advisor by the end of their first academic year. The student’s dissertation advisor will chair a Ph.D. Dissertation Committee that will consist of a minimum of two additional members of the Academic Senate, who will normally also be participating members of the Biophysics Graduate Program. All committee members should be able to provide guidance and judge the scholarship of the dissertation research. The student is expected to meet with his/her Dissertation Committee once a year in an Annual Research Evaluation, in which the student formally presents his/her work to date and progress is assessed and input to the research project provided by the committee. During this time, students will be enrolled in sufficient credits of directed research (tentatively BPHY 299) to ensure good standing in the Graduate Division. A written dissertation will be completed by each student in the program.

2.7) Final examination. Doctoral candidates will defend their dissertations in a public, oral presentation at a time announced to members of the University community. The public presentation will be followed by a private defense of the dissertation to the Dissertation Committee, which will make a recommendation to the Graduate Division as to whether the degree of Ph.D. should be conferred.

2.8) Explanation of special requirements. None.
2.9) **Relationship of M.S. and Ph.D. programs.** Students will normally be admitted to the Ph.D. program. Upon passing the Qualifying Examination and advancement to Candidacy, the student may petition the Graduate Division for conferral of the M.S. degree.

2.10) **Special preparation for careers in teaching.** Not applicable.

2.11) **Sample Ph.D. program.** Students enrolled in the proposed program will be expected to complete an individualized curriculum that will include the core coursework described in Section 2.3d above, with additional coursework tailored to the student’s research interests and background (including remediation of deficiencies identified upon admission to the program). Table 2 provides a sample program designed to meet the needs of a student wishing to work in the area of structural biology, with an emphasis in protein structure determination as elucidated by NMR.

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<th>Fall</th>
<th>Winter</th>
<th>Spring</th>
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<tr>
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<td>BIOL 203 (Intro)</td>
<td>BCH 184 (Intro)</td>
<td>PHYS 246 (Intro)</td>
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<td></td>
<td>BPHY 252 (Seminar)</td>
<td>BPHY 252 (Seminar)</td>
<td>BPHY 252 (Seminar)</td>
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<td>BPHY 290 (Lab Rotation)</td>
<td>BPHY 290 (Lab Rotation)</td>
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<td>Elective</td>
<td>Elective</td>
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<tr>
<td>Year 2</td>
<td>CHEM 209M (Introduction to NMR)</td>
<td>CHEM 229Q (Advanced NMR)</td>
<td>BCH 210 (Bch Macromol)</td>
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<td></td>
<td>BPHY 252 (Seminar)</td>
<td>BPHY 252 (Seminar)</td>
<td>BPHY 252 (Seminar)</td>
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<td>BPHY 297 (Research)</td>
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<tr>
<td>Years 3-5</td>
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<td></td>
<td>BPHY 299 (Dissertation Research)</td>
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2.12) **Normative time from matriculation to degree.** A typical doctoral student will be expected to complete all degree requirements in approximately five years.

**Section 3.Projected Need**

3.1) **Student demand for the program.** The National Research Council recognizes Biochemistry, Biophysics and Structural Biology as major disciplines in the Life Sciences, and specifically ranks Ph.D. programs in these areas. Biophysics and Computational Biology is also a major section of Proc. Natl. Acad. Sci. (USA), emphasizing its importance as a discipline. Significant breakthroughs over the past decade in protein structure determination and a variety of imaging methodologies, new insights into the dynamic behavior of individual protein molecules and advances in understanding the relationship of structure to function (in systems ranging from nitrogen fixation and photosynthesis to the replisome and signal transduction) have brought great attention to Biophysics. These advances in turn have attracted students eager to participate in such discoveries. At the same time, a wide range of career opportunities await individuals trained in biophysics, including positions in the pharmaceutical and chemical industries, academia and both public and private research institutions. The proposed graduate program will provide a coherent, campus-wide umbrella organization under which faculty efforts and resources can be marshaled, faculty and student interactions and research/grant productivity facilitated, and the overall reputation of the campus in the field enhanced. This will then generate even greater interest among potential students who will be attracted to the program. While

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students interested in the research programs of the participating faculty are already entering one or another existing departmental graduate program, a formal interdepartmental program will provide prospective students with greater educational and training opportunities and be of greater interest to students specifically seeking a degree in Biophysics. Again, the expectation is that the proposed program will attract a cadre of students who would not otherwise consider coming to UC Riverside and is not expected to have a negative impact on existing graduate programs. It will also address a significant manpower need on the part of the research programs of present and future faculty working in the area.

3.2) Opportunities for placement of graduates. There is high demand for biophysicists in a broad range of areas. The development of new drugs in the pharmaceutical industry is increasingly guided by the detailed three-dimensional structures of therapeutic targets (e.g., reverse transcriptases, viral coat protein maturases, membrane channel proteins) and by the modeling of their dynamic behavior and interaction with potential drugs. Similarly, the chemical industry has become increasingly invested in the use of individual enzymes and even entire metabolic pathways in the development of more efficient methods to produce a wide range of commodity and fine chemicals. The US National Laboratories have had a long-standing and strategic interest in the application of sophisticated physical methods to understand biological systems and processes, as have private research institutions such as the Scripps Research Institute and Howard Hughes Medical Institute. Finally, recruitment of biophysicists has become a priority in academia nationwide, and particularly in biomedically relevant areas. This national trend is reflected in recent faculty recruitment at UC Riverside in the Departments of Biochemistry, Bioengineering and Chemistry, and to a lesser extent the Department of Physics. There is every reason to believe that students receiving a Ph.D. in Biophysics from UC Riverside will have excellent job prospects.

3.3) Importance to the discipline. Biophysics is an inherently interdisciplinary enterprise, with strong components drawn from Physics, Biochemistry, Mathematics and Chemistry, as well as other life sciences. Having a Ph.D. program that will provide a coherent training program to students across disciplinary lines will provide students with an exceptionally broad perspective that will make them extremely well-qualified to contribute at the cutting edge of modern research in the area. The broad disciplinary distribution of participating faculty in the proposed program will greatly contribute to the breadth of training provided at UC Riverside.

3.4) Ways in which the Program will meet societal needs. Over the past 50 years, many of the most important advances in our understanding of the processes of life have been made by biophysicists. Signal contributions include: discovery of the atomic-resolution structure of DNA; elucidation of the genetic code and mechanism of information transfer in biological systems; structure of the ribosome, photosynthetic and nitrogen-fixation systems; behavior of individual molecules of the replisome, topoisomerase, helicase and other complex enzymatic systems working on DNA; the physical basis of transmembrane ion transport, particularly as relates to neuronal function; and visualization/analysis of neural networks. These and other advances have contributed enormously to our understanding of various disease states, including cancer and heart disease, and to the improvement of human health. Students in the proposed Biophysics Program will be able to participate in either basic or applied research in these and other emerging areas and thus contribute to a deeper understanding biological processes and to improved human health.

3.5) Relationship of the Program to research interests of the faculty. Many faculty members at UC Riverside are engaged in biophysics-related research, including a significant number of new hires
in the Departments of Biochemistry and Chemistry. The participating faculty are spread across five different departments, and an interdepartmental graduate program such as proposed will provide an effective and much-needed mechanism for facilitating productive interactions among the participating faculty and for generating an enriched training environment for its students.

3.6) Program differentiation. Most UC campuses have graduate programs in biophysics (UC Irvine has a Department of Physiology and Biophysics in its School of Medicine), and a biophysics program on each campus is easily justified in light of the information provided in Sections 3.1 - 3.5 above. The strongly supportive letters from the Directors of the interdepartmental graduate programs in Biophysics at Berkeley and Davis (Appendix III) attest to the lack of perceived competition with existing programs at other UC campuses. The proposed program is distinctive in the range of specific physical methods employed by its participating faculty as well as the breadth of the particular biological systems and processes under investigation, factors which combine to provide a unique training environment.

Section 4. Faculty

The 27 participating faculty in the proposed Biophysics Graduate Program are self-identified from among five departments in the College of Natural and Agricultural Sciences; of these eight are women and eleven are minority. Each has a significant component of biophysics in his or her research program. Detailed curricula vitae are provided in Appendix I, and individual letters of participation in Appendix II. Letters from the Chairs of the Departments of Biochemistry, Biology, Botany and Plant Sciences, Chemistry and Physics and Astronomy are provided in Appendix III, along with letters from the Directors of interdepartmental graduate programs at UC Berkeley, UC Davis and UC San Francisco. Letters of support from the Dean of CNAS can be found in Appendix IV, and a memorandum from the Executive Committee of CNAS in Appendix V.

**Biochemistry**
- Gregor Blaha (Assistant Professor, Ph.D.)
- Richard Debus (Professor, Ph.D.)
- Li Fan (Associate Professor, Ph.D.)
- Russ Hille (Distinguished Professor, Ph.D.)
- Seán O'Leary (Assistant Professor, Ph.D.)
- Jeff Perry (Assistant Professor, Ph.D.)
- Jikui Song (Assistant Professor, Ph.D.)

**Biology**
- Richard Cardullo (Professor, Ph.D.)
- Theodore Garland (Distinguished Professor, Ph.D.)
- Nicole Rafferty (assistant Professor, Ph.D.)

**Botany and Plant Sciences**
- Darrel Jenerette (Associate Professor, Ph.D.)
- Dawn Nagel (Assistant Professor, Ph.D.)
- Carolyn Rasmussen (Assistant Professor, Ph.D.)
- Louis Santiago (Associate Professor, Ph.D.)

**Chemistry**
- Huiwang Ai (Assistant Professor, Ph.D.)
- Chia-en Chang (Associate Professor, Ph.D.)
- Joseph Genereux (Assistant Professor, Ph.D.)
- Richard Hooley (Associate Professor, Ph.D.)
- Ryan Julian (Professor, Ph.D.)
- Len Mueller (Professor, Ph.D.)
- Yinsheng Wang (Professor, Ph.D.)
Section 5. Courses

No new didactic courses are required to implement the proposed program, although new Biophysics Seminar (tentatively BPHY 252), Research Rotation (tentatively BPHY 297) and Dissertation Research (tentatively BPHY 299) courses will need to be established. Three existing courses, BCH 184 (Physical Biochemistry, 4 units), BIOL 203 (Cellular Biophysics, 3 units) and PHYS 246 (Biophysics, 4 units each) will constitute the core curriculum for the proposed program. Syllabi for these three courses along with their catalog descriptions are provided in Appendix V. Additional elective courses appropriate for the program include:

- BCH 186 (Topics in Molecular Bioenergetics, 3 units)
- BCH 187 (Fundamentals of Enzymology, 3 units)
- BCH 210 (Biochemistry of Macromolecules, 4 units)
- BCH 230F (Advanced Topics in Biochemistry: Enzymology)
- CHEM 201A (Advanced Physical Chemistry: Quantum Mechanics, 3 units)
- CHEM 201B (Advanced Physical Chemistry: Quantum Mechanics and Spectroscopy, 3 units)
- CHEM 201C (Advanced Physical Chemistry: Elementary Statistical Mechanics, 3 units)
- CHEM 201D (Advanced Physical Chemistry: Thermodynamics, 3 units)
- CHEM 201E (Advanced Physical Chemistry: Kinetics, 3 units)
- CHEM 206A (Introduction to Computational Quantum Chemistry, 3 units)
- CHEM 206B (Modeling Chemical and Biochemical Molecules, 3 units)
- CHEM 209M (Introduction to NMR, 3 units)
- CHEM 211D (Spectrometry in Organic Structure Analysis, 3 units)
- CHEM 229Q (Advanced NMR, 3 units)
- PHYS 145ABC (Biophysics, 4 units each)
- PHYS 212A (Thermodynamics and Statistical Mechanics I, 4 units)
- PHYS 212B (Thermodynamics and Statistical Mechanics II, 4 units)

Catalog descriptions of the above courses are provided in Appendix VII. All courses are currently offered, (some in alternate years), and all are currently staffed. New elective courses can be added upon approval as described in Section 8.

Section 6. Resource Requirements

6.1) FTE faculty. No additional faculty positions are sought, although new or replacement positions awarded to departments with participating faculty in the proposed program can reasonably be expected to expand the program over time. The process for admitting new faculty to the program is described in Section 8, in Article II.1 of the by-laws. Administrative support will be provided by the Graduate Student Affairs Center of CNAS, which presently administers 16 graduate programs; as indicated above one staff member has already volunteered to work with the proposed program. Support for the Director will be provided by CNAS commensurate with that provided other Directors of interdepartmental graduate programs (e.g., Cell, Molecular and Developmental Biology; Genetics, Genomics and Bioinformatics; Environmental Toxicology), as described in the letters provided by
6.2) **Library acquisition.** The UCR library system, in particular the Science Library, currently subscribes to all the major journals relevant to Biophysics, and also purchases the important books, monographs and the like in the field. No increase in demand for new acquisitions is anticipated.

6.3) **Computing costs.** No increases in computing costs are anticipated. Personal computer facilities are available in the laboratories of all the participating faculty, providing access to the Internet. The computer facilities of the Science Library are also available to student and participating faculty of the program. More advanced computing capabilities are available in the laboratories of several of the participating faculty, who also have access to off-campus supercomputing facilities as needed.

6.4) **Equipment.** No new equipment is required to implement the proposed program, although one of the expected benefits accruing from its creation is that greater interaction among laboratories will identify common equipment needs for which extramural funds will be sought. While institutional matching funds are typically required of granting agencies in making such awards, these are usually modest relative to the total cost of the instrumentation. As a particular example, plans are being made for the submission of a proposal for a 900 MHz NMR instrument that will be used by several of the participating faculty of the proposed program, to be housed in space already available in the Chemical Sciences Building.

6.5) **Space and other capital facilities.** None, although again plans are being made for the submission of a proposal for a 900 MHz NMR instrument that will be used by several of the participating faculty of the proposed program, to be housed in specifically designed space already available in the Chemical Sciences Building. Additional space may be made available in the MRB1 building that is presently under construction, scheduled for completion at the end of 2018.

6.6) **Other operating costs.** As indicated above, support for the Director of the proposed program will be provided by CNAS, consistent with its policies as outlined in the Deans’ letters (Appendix IV). Additionally, administrative services will be provided by the CNAS Graduate Student Affairs Center as discussed above. Again, this Center already provides administrative support for 16 graduate programs, and the proposed program does not substantively increase its workload. A staff member of the Center has already volunteered to serve the proposed program.

**Section 7. Graduate Student Support**

Graduate students in the proposed program will be supported by a combination of sources. Support in the first year will be provided by fellowships through the Graduate Division, and creation of the program is consistent with the Graduate Division’s projected growth of graduate fellowships as the number of faculty increases. In consultation with the Graduate Division, former Dean Childers was enthusiastic about creation of the program. At the end of the first year students will have selected a dissertation advisor and will typically be supported thereafter as research assistants on grants awarded to their dissertation advisors, individual pre-doctoral fellowships from federal granting agencies and private foundations, and/or teaching assistantships provided either by the home department of the student’s dissertation advisor or through the Teaching Assistantship Allocation Committee (TAAC), which makes assignments for all graduate programs in the Life Sciences. The TAAC has a strong track record of providing support for graduate students in 16 different graduate programs, specifically including successful interdepartmental graduate programs such as Cell, Molecular and Developmental Biology and Genetics, Genomics and Genomics. While the Graduate
Division has no formal requirement for 301/302-level coursework to provide training in becoming a teaching assistant, biophysics students holding teaching assistantships in departments that require 301/302 coursework will take them. The departments with participating faculty in the program will work in partnership with the Graduate Division and CNAS to ensure continuous funding for all the program’s students in good academic standing throughout their time in the proposed program as described in Deans’ letters provided in Appendix IV. It is to be emphasized that there are a number of very successful interdepartmental graduate programs on campus and that there has never been a case where a graduate student in good academic standing in CNAS ever had to leave a graduate program, departmental or interdepartmental, for lack of funding. CNAS has demonstrated an outstanding track record to support for graduate students that is clearly articulated in the Deans’ letters in Appendix IV and is far more specific than letters of support for past proposals for the creation on interdepartmental graduate programs (e.g., GGB, CMDB and Materials Science). Students in the proposed program can thus expect to have the benefit of appropriate support from the college.

Section 8. Governance

The Program will be administered by a Director and a three-member Executive Committee. The Director, in conjunction with an administrator from the CNAS Graduate Affairs Center, will be responsible for the day-to-day operation of the program, including admissions, student advising and monitoring students’ progress through the Program. The members of the Executive Committee will chair subcommittees for Graduate Admissions, Graduate Oversight and Curriculum, with each subcommittee comprised of two additional participating faculty members from the Program.

The proposed graduate program will be governed by the following by-laws:

Article I. Objective

The proposed Biophysics Graduate Program is intended to encourage broad-based study of biophysics and to foster communication between biophysicists within different departments on the UC Riverside campus. The Program is thus intended to be interdepartmental, and includes some 39 faculty from the departments of Biochemistry, Bioengineering, Biology, Botany and Plant Sciences, Chemical and Environmental Engineering, Chemistry and Physics. The program’s primary objective is to train scientists able to teach and conduct research in the area of biophysics. The proposed Biophysics Program will offer both a M.S. and a Ph.D. in Biophysics.

Given the diversity in the biophysics community on campus, graduate students will have the opportunity to incorporate a wide range of disciplines into their training experience. Programs of study will be tailored to the interests and goals of individual students.

Article II. Membership

1) Membership Criteria. The participating faculty recognize that involvement in a graduate program can take many forms, although the principal one is obviously training of graduate students in the field as broadly defined. Criteria for membership can include 1) maintenance of an active research program in the area of biophysics as broadly defined; 2) service on graduate student General Examination and Dissertation Committees; 3) continued participation in the Biophysics program by emeritus faculty, and 4) support of research endeavors in the field of biophysics by non-academic senate members. Approval of new members to the Biophysics program will be vested in the Executive Committee. Faculty requesting membership in the Biophysics Program should send a curriculum vitae to the Graduate Program Director along by a letter describing how the candidate expects to be involved in the program. The Director will then forward the documents to the rest of the Executive Committee for consideration.
2) **Membership Retention.** The membership status of Biophysics faculty will be reviewed every three years by the Executive Committee. Criteria used to evaluate members can include serving as a major professor or as a member of advisory, candidacy exam or supervisory committees for Biophysics graduate students; service on committees of the Biophysics Program; attendance at seminars; participation in recruitment activities and other Biophysics Program functions. Faculty whose membership is to be evaluated will be notified in Fall of the academic year and may be asked to supply a brief summary of their Biophysics-related activities to the Executive Committee by the end of the Fall quarter. The Executive Committee will complete its evaluations by the end of Winter quarter of the same academic year.

3) **Termination of Membership.** A participating faculty member who wishes to leave the program may request termination of their membership at any time by sending a memo to the Program Director. Program members whose participation is deemed below that sufficient for good standing will be reviewed by the Executive Committee to determine the source of any problems and to recommend solutions. Members will be given a year to improve their participation in the Biophysics Program before facing termination.

**Article III. Organization and Administration**

The administration of the program and its activities will be vested in an Executive Committee consisting of three program members in addition to the Biophysics Program Director, who will serve as chair. Each of these will chair one of the three standing committees of the Program: Recruitment and Admissions, Graduate Oversight and Curriculum.

1) **Program Director.** The Graduate Program Director will be responsible for the overall direction and organization of the Biophysics Program and will chair the Executive Committee. The appointment of the Program Director will be in keeping with the regulations of Graduate Council. Initially, the Dean of the Graduate Division will solicit nominations from the program faculty and make an appointment. Afterwards, the Executive Committee will solicit confidential nominations from the participating faculty and submit the names of no more than two qualified faculty to the Dean of the Graduate Division, along with a supporting statement for each nominee. The Dean of the Graduate Division will forward his/her final nominee to the Chancellor, who will make the actual appointment of the new Program Director. The Biophysics Program Director will be the Biophysics representative at CNAS chairs meetings and other meetings on campus requiring representation of the program. The Biophysics Program Director will send nominations of faculty to serve as Graduate Advisor to the Dean of the Graduate Division as well as nominations of faculty to serve as chairs of the program’s standing committees. The Biophysics Program Director will appoint additional members to these standing committees (see below).

2) **Chair, Recruitment and Admissions.** The chair of the Recruitment and Admissions committee will be responsible for recruiting students to the Program and assessing the files of applicants to the program. The Recruitment and Admissions Chair will be nominated by the Biophysics Program Director, with final approval given by the Dean of the Graduate Division.

3) **Chair, Graduate Oversight.** The chair of the Graduate Oversight Committee will serve as Graduate Advisor and will be responsible for the overall academic advising of students in the Biophysics Program. S/he will be responsible for revisions of the Graduate Student Handbook and will be responsible for setting up faculty rotation schedules for first-year graduate students. S/he will also be responsible for advising students as to forming their Qualifying Examination and Dissertation Committees, and will have responsibility of the Program’s annual Comprehensive Examination. The Dean of the Graduate Division will give final approval of the Qualifying Examination and Dissertation Committees. As Graduate Advisor, the chair of the Graduate Oversight Committee
will be nominated by the Biophysics Program Director, with final approval given by the Dean of the Graduate Division.

4) **Chair, Curriculum.** The chair of the Curriculum Committee will oversee the assessment of the Program curriculum and implementation of changes in same, as described further below. With his/her committee, s/he will also have overall responsibility for organizing the Program’s seminar series. The Recruitment and Admissions Chair will be nominated by the Biophysics Program Director, with final approval given by the Dean of the Graduate Division.

**Article IV. Committees**

1) **Executive.** The administration of the program and its activities will be vested in an Executive Committee consisting of four members: Biophysics Program Director who will serve as chair, and the chairs of the program’s three standing committees. The Executive Committee will act in an advisory capacity to the Program Director for any issues that arise concerning the Biophysics Program and will be responsible for review and approval of new faculty to the Biophysics program and for final decisions on termination of membership. The Executive Committee will also facilitate the process used to nominate new Program Directors. It will meet at least once per year, more frequently as needed.

2) **Recruitment and Admissions.** The Recruitment and Admissions Committee will be responsible for recruitment activities and review of applications of students who wish to enter the Biophysics Program. This committee will send files of qualified applicants, along with supporting documentation, to the Graduate Division Dean, who will make the final decision regarding admission and Graduate Division fellowship support. The Recruitment and Admissions Committee will also coordinate the recruitment visits of admitted graduate students to UCR, oversee the maintenance of the program website and prepare advertising/recruitment materials for the program.

The Recruitment and Admissions Committee will consist of the committee Chair from the Executive Committee plus two participating faculty members appointed by the Director, and will meet as necessary to review files and plan recruitment activities. The term of membership on the Admissions Committee will be three years.

3) **Graduate Oversight.** The Graduate Oversight Committee will be responsible for overseeing students’ progress through the program, and will assist the Chair of the committee in forming students’ Qualifying Examination and Dissertation Committees, and in the preparation of the Program’s annual Comprehensive Examination.

The Graduate Oversight Committee will consist of the committee Chair from the Executive Committee plus two participating faculty members appointed by the Director, and will meet as necessary to undertake its responsibilities. The term of membership on the Admissions Committee will be three years.

4) **Curriculum.** The Curriculum Committee will be responsible for assessment of and changes to the curriculum of the Biophysics program, and will make recommendations for such changes to the curriculum as are deemed appropriate, including the addition of new elective courses, to the participating Biophysics faculty during a Biophysics faculty meeting. A subsequent e-mail vote will be held to approve or disapprove the recommended changes. In order to be considered approved, at least 51% of the participating program faculty must vote in favor of the changes to the program curriculum. The Curriculum Committee will also be responsible for administering the Program’s seminar series, selecting and hosting speakers and planning program retreats or research symposia. The Curriculum Committee will meet at least once per year.
The Curriculum Committee will consist of the committee Chair from the Executive Committee plus two participating faculty members appointed by the Director, and will meet as necessary to undertake its responsibilities. The term of membership on the Admissions Committee will be three years.

*Article V. Changes to the By-Laws*

Changes to the by-laws of the program will be considered at a meeting of the participating faculty, and a subsequent e-mail vote will be held to approve or disapprove the proposed changes. In order to be considered approved, at least 51% of the participating program faculty must vote in favor of the changes to the program’s by-laws.

*Section 9. Changes in Senate Regulations*

No changes in Academic Senate Regulations are required.

**Appendices**

I. Faculty CV’s

II. Faculty Letters of Participation

III. Departmental Chair and Program Director Letters

IV. Letters from CNAS Dean

V. CNAS Executive Committee memo

VI. Syllabi for Core Courses

VII. Course Catalog Descriptions of Elective Courses
Appendix I. CV’s of participating faculty

Huiwang Ai (Assistant Professor, Chemistry, Ph.D.)
Mark Alber (Distinguished Professor, Physics, Ph.D.)
John Barton (Assistant Professor, Ph.D., Physics, arriving 1/1/18)
Gregor Blaha (Assistant Professor, Biochemistry, Ph.D.)
Chia-en Chang (Associate Professor, Chemistry, Ph.D.)
Richard Cardullo (Professor, Biology, Ph.D.)
Richard Debus (Professor, Biochemistry, Ph.D.)
Li Fan (Associate Professor, Ph.D.)
Theodore Garland (Distinguished Professor, Biology, Ph.D.)
Joseph Genereux (Assistant Professor, Chemistry, Ph.D.)
Russ Hille (Distinguished Professor, Biochemistry, Ph.D.)
Richard Hooley (Associate Professor, Chemistry, Ph.D.)
Darrel Jenerette (Associate Professor, Botany and Plant Sciences, Ph.D.)
Ryan Julian (Professor, Chemistry, Ph.D.)
Umar Mohideen (Professor, Physics, Ph.D.)
Len Mueller (Professor, Chemistry, Ph.D.)
Dawn Nagel (Assistant Professor, Botany and Plant Sciences, Ph.D.)
Seán O’Leary (Assistant Professor, Biochemistry, Ph.D.)
Jeff Perry (Assistant Professor, Biochemistry, Ph.D.)
Nicole Rafferty (assistant Professor, Biology, Ph.D)
Carolyn Rasmussen (Assistant Professor, Botany and Plant Sciences, Ph.D.)
Louis Santiago (Associate Professor, Botany and Plant Sciences, Ph.D.)
Jikui Song (Assistant Professor, Biochemistry, Ph.D.)
Yinsheng Wang (Professor, Chemistry, Ph.D.)
Min Xue (Assistant Professor, Chemistry, Ph.D.)
Wenwang Zhong (Professor, Chemistry, Ph.D.)
Roya Zandi (Professor, Physics, Ph.D.)
Research statement

Biological signaling occurs at different levels, but basic processes are largely chemically based. Our research program in the fields of Bioanalytical Chemistry and Chemical Biology has a focus on the engineering of novel molecular probes to peer into cells and brains to understand their communications. We use a collection of innovative techniques, such as protein engineering and fluorescence and bioluminescence imaging, to dissect signaling pathways involving redox-active molecules, neurotransmitters, and protein post-translational modifications (PTMs). Our immediate goal is to monitor biological signaling in real time with excellent spatial resolution and molecular precision in physiologically relevant environments. Our long-term goal is to apply these new probes to live cells and animals to understand communications relevant to toxicity of chemicals, cancer development and progression, cognition and behavior, and neurological disorders.

Education and training

07/2008-06/2011  Postdoctoral Fellow, The Scripps Research Institute, La Jolla, USA Advisor: Peter G. Schultz

09/2003-06/2008  Ph.D. in Chemical Biology from Department of Chemistry, University of Alberta, Edmonton, Canada Advisor: Robert E. Campbell; Thesis titled “New Fluorescent Proteins and Genetically Encoded Biosensors”

09/1999-07/2003  B.Sc. from Department of Chemistry, Tsinghua University, Beijing, China

Publications

Publications at UCR


22. Z. Chen, W. Ren, Q.E. Wright and H-w. Ai*, “Genetically Encoded Fluorescent Probe for...


Before coming to UCR


**Patent and technology transfer**


2. pnGFP (publication #21), hsGFP (publication #25), pMAH2-CageCys (publications #30 and #36), rrRFPs (publications #29 and #35) and several other inventions are distributed through Addgene (Cambridge, MA; http://www.addgene.org/Huiwang_Ai/).


4. Anaptys Biosciences (La Jolla, CA) has licensed the right to use the gene encoding mTFP1 (publication #4) for private research; Genentech (Oceanside, CA) has been approved for the usage of EBFP2 (publication #6) for research purpose; mKalama1 and EBFP2 (publication #6), mAmetrine (publication #11), and mNectarine (publication #12) are distributed through Addgene (Cambridge, MA).
Awards and honors

- UCR Academic Senate Regents’ Faculty Development Award, July 2016.
- The Chinese-American Chemistry & Chemical Biology Professors Association (CAPA) Distinguished Junior Faculty Award, 2016
- Young Investigator in Analytical and Bioanalytical Science, Analytical and Bioanalytical Chemistry Themed Issue, 2016
- National Science Foundation CAREER award, May 2014
- Hellman Fellows Award, The Hellman Fellows Fund, July 2013
- Young Investigator in Analytical and Bioanalytical Science, Analytical and Bioanalytical Chemistry Themed Issue, 2012
- UCR Academic Senate Regents’ Faculty Fellowship (RFF), June 2012.
- The Chinese American Faculty Association (CAFA) Robert T. Poe Faculty Development Award, February 2012.
- Andrew Stewart Memorial Graduate Prize, Faculty of Graduate Studies and Research, University of Alberta, May 2008.
- Professional Development Grant, University of Alberta, May 2007
- Mary Louise Imrie Graduate Student Award, University of Alberta, March 2007

Oral presentations

37. H.-w. Ai, “Imaging redox and Zn$^{2+}$ signaling with genetically encoded fluorescent probes”, Department of Pharmacology, Baylor College of Medicine, Houston, TX, April 27, 2016.
34. H.-w. Ai, “Fluorescent probes to probe redox and Zn$^{2+}$ signaling”, Department of Chemistry, University of Kansas, Lawrence, KS, April 1, 2016.
12. H-w. Ai, “Fluorescent Tools for Cell Redox Signaling and a Click-Type Bioconjugation


**Before coming to UCR**


3. H-w. Ai, “Expanding the fluorescent protein ‘toolkit’: new FRET pairs for live cell imaging”. Invited oral presentation in *Division of Analytical and Environmental Toxicology, Faculty of Medicine and Dentistry, University of Alberta*, Edmonton, Alberta, June 20, 2008.


**Poster presentations**


Andover, NH.


Meetings

- Howard Hughes Medical Institute Janelia Conference, “Fluorescent Proteins and Biological Sensors V”, Janelia Research Campus, Ashburn, VA, Nov. 6-9, 2016.
- The 251th ACS National Meeting and Exposition, San Diego, California, March 13-17, 2016.
- Society of Western Analytical Professors 2016 Meeting, Riverside, CA, Jan. 29-30, 2016.
- City of Hope-UC Riverside Biomedical Research Initiative Workshop, City of Hope, Duarte, CA, Oct. 17, 2015.
- The 2015 Bioorganic Chemistry Gordon Research Conference, Proctor Academy, Andover, NH, June 7-12, 2015.
- The 248th ACS National Meeting and Exposition, San Francisco, California, Aug. 10-14, 2014
- The 97th Canadian Chemistry Conference and Exhibition, Vancouver, British Columbia, June 1-5, 2014.
- Society of Western Analytical Professors 2014 Meeting, Arizona State University, Tempe, Arizona, Jan 9-10, 2014.


The 48th CSBMCB Annual Meeting, Banff, Alberta, March 16-20, 2005

CIHR group in protein structure and function special symposium on Frontiers in Structural Biology, Faculte St. Jean, University of Alberta, May 6-7, 2004

Additional trainings

- HHMI/National Academies Scientific Teaching Summer Institute, Riverside, CA, June 22-27, 2014
- NIH (NIGMS) Mentoring Workshop for New Faculty in Organic and Biological Chemistry, Dallas, TX, June 25-27, 2012
- Teaching Workshop by the UCR Academy of Distinguished Teachers, April 20, 2012.

Teaching experience

- Winter 2016, Chemical Biology (CHEM 143)
- Winter 2015, Bioorganic Chemistry (CHEM 143)
- Fall 2013, Fall 2014, and Spring 2016 Optical Spectroscopy (CHEM 221B)
- Fall 2012, Fall 2013, Fall 2014 and Fall 2015, Instrumental Methods of Analysis- Laboratory (CHEM 125L)
- Winter 2012 and Winter 2013, General Chemistry (CHEM 1B)
- Fall 2011 and Fall 2012, Introduction to Bioanalytical Chemistry (CHEM 221E)

Experience to review grants

- NSF Peer Review Panel “Chemical Probes of Biological Processes-P151195”, Feb 2015
- Ad hoc Reviewer for Canada Foundation for Innovation, September 2012
- Ad hoc Reviewer for Czech Science Foundation, September, 2012

Other experience and professional memberships

- 2007-present Member, American Chemical Society (ACS)
- 2012-present Member, American Association for the Advancement of Science (AAAS)
- 2013-present Referee Editor for Frontiers in Chemistry (Chemical Biology section)
- 2014-present Member of the AB SCIEX Innovation Advisory board
- 03/2016 Symposium Chair, the 251st ACS National Meeting. Symposium titled: “Luminescent proteins, dyes, and sensors”
- 01/2016 Co-organizer, the 47th annual meeting for the Society of Western
Analytical Professors (SWAP)

- 08/2014  Associate Symposium Chair, the 248th ACS National Meeting. Session titled: “Pro-fluorogenic probe-based methods for disease detection”
- 03/2013  Guest Editor for the journal Sensors (ISSN 1424-8220) for a special issue on “fluorescent biosensors”
- 03/2012  Symposium Chair, the 243rd ACS National Meeting. Symposium titled: “Fluorescent imaging of cellular structures and dynamics”

Additional activities

- Consultant for SafeWhite, Inc (2015)
- Graduate Student Admission Committee Member of UCR ETOX (2011-2014), CMDB (2012) and Chemistry (2014)
- UCR Department of Chemistry Kohler Lecturer Committee Member (2012)
- UCR Committee on International Education Member (since 2014)
- Qualifying/Oral Exam Committee member, Thesis Committee member, and 2nd Year Oral Exam Committee member for more than 20 UCR graduate students in various graduate programs.

Research Support (Ongoing):

National Institute of Health R01GM118675  Ai (PI)  05/10/2016-03/31/2020
A Fluorescent Toolkit for Imaging Reactive Oxygen Species (ROS)
Role: PI  $1,225,869

National Institute of Health R21EB021651  Ai (PI)  08/01/2016-06/30/2018
Expansion of Unnatural Fluorescent Protein Probes
Role: PI  $387,500

National Science Foundation CHE-1351933  Ai (PI)  05/01/2014-04/30/2019
CAREER: Expanding the Toolbox of Encodable Fluorescent Probes to Image Macrophage Redox Dynamics
Role: PI  $600,000

National Science Foundation REU supplement  Ai (PI)  07/01/2016-04/30/2019
Role: PI  $12,000

National Institute of Health R03EB20211  Ai (PI)  03/01/2015-12/31/2016
Lentiviral Systems for Controlled Mammalian Expression of Unnatural Fluorescent Protein Probes
Role: PI  $152,000
UCR Academic Senate Faculty Development Award  Ai (PI)  07/01/2016-06/30/2018  
Genetically Encoded Fluorescent Biosensors for Serotonin  
Role: PI  
$7,500

Yetongren Medical Group  Ai (PI)  07/01/2013-06/30/2016  
Unlimited Research Gift  
Role: PI  
$145,000

Research/Education Support (Completed):  

Collaborative Seed Grant, UCR  Ai (PI)  07/01/2015-12/31/2015  
Redox Reporter-Modified Human Stem Cells for Assessing Environmentally Induced Oxidative Stress  
Role: PI  
$10,000 (1/2 to Ai)

Collaborative Seed Grant, UCR  Pirrung (PI)  07/01/2015-12/31/2015  
Luciferin Engineering for Bioassays  
Role: Co-PI  
$10,000 (1/2 to Ai)

Collaborative Seed Grant, UCR  Ge (PI)  07/01/2014-12/31/2014  
Convert Electricity to Chemicals by Novel Biocatalysts  
Role: Co-PI  
$12,000 (1/3 to Ai)

Robert T. Poe Faculty Development Grant  Ai (PI)  02/01/2012-01/31/2013  
Genetically Encoded Biosensors for Hydrogen Sulfide  
Role: PI  
$1,500

UCR Academic Senate Regents’ Faculty Fellowship  Ai (PI)  07/01/2012-06/30/2014  
Novel Encodable Fluorescent Biosensors for Imaging Cell Redox Homeostasis  
Role: PI  
$3,500

Hellman Fellowship  Ai (PI)  07/01/2013-06/30/2014  
Spatiotemporal Control of Metal Ion Signaling with Engineered Fluorescent Proteins  
Role: PI  
$30,000

Beckman Coulter Life Sciences  Zhong/Ai (PI)  11/2012  
A "Biopharma to Education" grant to acquire a capillary electrophoresis (CE) instrument for teaching  
Role: co-PI  
A CE Instrument

Training of students and postdoctoral researchers

Current Graduate Students:  
- Yichong Fan (Graduate Student in ETOX Ph.D. Program, since 09/2012; Awards: 2016 UCR Dissertation Year Fellowship, and Presentation award in 2016 UCR ETOX symposium)  
- Shen Zhang (Graduate Student in CHEM Ph.D. Program, since 09/2013)
Tan Truong (Graduate Student in CMDB Ph.D. Program, since 04/2014)
Andy Yeh (Graduate Student in CHEM Ph.D. Program, since 09/2014; Award: Graduate scholarship from Yin Chin Foundation of USA)

Current Postdoctoral Researcher:
- Dr. Ao Ji (since 01/2013)
- Dr. Qi Qian (since 01/2016)

Current Undergraduate Students:
- Merna Makar (Award: 2015 Kuwana-Sawyer Award for Undergraduate Researchers)
- Maria Erika Gonzales
- Ramsey Batarseh
- Cebrina Nolan

Former Group Members:
- Dr. Zhijie Chen: Graduate Student in CHEM Ph.D. Program, 09/2011-06/2016; Awards: Chinese Government Award for Outstanding Self-Financed Students Abroad; Sawyer Award for Analytical Chemistry Graduate Students; James Merrill and Adeline Wallace Annual Prize; Currently appointed as a postdoc fellow by Prof. Carlos Bustamante at UC Berkeley
- Dr. Suzan Youssef: Graduate Student in CHEM Ph.D. Program, 09/2011-06/2016; Currently appointed as a Lecturer at Crafton Hills Community College
- Dr. Wei Ren: Graduate Student in CHEM Ph.D. Program, 09/2012-06/2016; Award: Sawyer Award for Analytical Chemistry Graduate Students; Currently at UCLA Anderson School of Management
- Dr. Si Chen: Postdoctoral Researcher from 09/2011 to 11/2012; currently at Humanwell Pharmaceutical Co., Ltd
- Dr. Yunhua Liu: Staff Research Assistant, 2013-2014; currently at Shanghai Agrobiological Gene Center
- Kansas Morgan: 2012 Summer Undergraduate RISE Program Researcher
- Kevin Micko Cheang: Undergraduate Student Researcher from 09/2011 to 06/2012
- Philip Lee: Undergraduate Student Researcher from 09/2012 to 08/2014; received 2014 Kuwana-Sawyer Award for Undergraduate Researchers; currently at UCI
- Quintin Wright: Undergraduate Student Researcher from 09/2011 to 06/2014; currently at the UCSF PharmD program
- Uyen Truong, Undergraduate Student Researcher from 01/2012 to 04/2015
- Jared Yasutake, Undergraduate Student Researcher from 04/2013 to 04/2015
- Gabriela Mamani, Undergraduate Student Researcher from 01/2015 to 07/2015; currently at Kaiser Permanente

High School Students:
Liana Amaro-Diaz (summer 2014); Jolie Carreon (summers 2014, 2015); Tyler Reagn (summers 2014, 2015); Michael Wang (summers 2014, 2015, 2016); Aislin Liu (summer 2016); Vaibhavi Shah (summer 2016); Jeanessa Mendoza (summer 2016)
NAME: Mark Alber

POSITION TITLE: Distinguished Professor of Mathematics, University of California at Riverside (UCR)

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.)

<table>
<thead>
<tr>
<th>INSTITUTION AND LOCATION</th>
<th>DEGREE (if applicable)</th>
<th>Completion Date MM/YYYY</th>
<th>FIELD OF STUDY</th>
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<tr>
<td>Moscow Institute of Technology, Moscow, Russia</td>
<td>Honors M.S.</td>
<td>1983</td>
<td>Applied Mathematics</td>
</tr>
<tr>
<td>University of Pennsylvania, Philadelphia, PA</td>
<td>Ph.D.</td>
<td>1990</td>
<td>Mathematics</td>
</tr>
</tbody>
</table>

A. Personal Statement

My research focuses on coupling multi-scale modeling and experiments to generate new hypotheses about biological mechanisms. I have been PI on several NIH and NSF funded collaborative projects on coupling novel multi-scale modeling of biological problems with biophysical experiments. In particular, my interdisciplinary group has developed and calibrated several multi-scale models of blood clot formation, epithelial tissue growth, chicken limb development, cell culture aggregation, bacterial swarming and microtubule dynamics. Many approaches developed by the group involve methods from biophysics, statistical physics and nonlinear dynamics. The information and articles below indicate my expertise in the areas of research relevant to the Biophysical Ph.D. proposal.

2009 – 2016    Vincent J. Duncan Family Professor of Applied Mathematics, University of Notre Dame
2003 – 2016    Concurrent Professor of Physics, University of Notre Dame
2011 – current, Elected Fellow, American Association for the Advancement of Science (AAAS)
2015 – current, Deputy Editor, PLoS Computational Biology
2008 - 2012    Member of the Editorial Board, Journal of Statistical Physics

Selected Publications related to Biophysics:


Chunlei Li, Jun Li, Holly V. Goodson and Mark S Alber [2014], Microtubule Dynamics Instability: the Role of Cracks between Proto_laments, Soft Matter 10, 2069-2080.

Oleg V. Kim, Zhiliang Xu, Elliot D. Rosen and Mark S. Alber [2013], Fibrin Networks Regulate Protein Transport during Thrombus Development, PLoS Computational Biology 9 (6), e1003095.

Cameron Harvey, Mark Alber, Lev Tsimring, Igor Aronson [2013], Continuum modeling of clustering of myxobacteria, New Journal of Physics 15, 035029.

Huijing Du, Zhiliang Xu, Morgen Anyan, Oleg Kim, W. Matthew Leevy, Joshua D. Shront and Mark Alber [2012], High density waves of the bacterium Pseudomonas aeruginosa in propagating swarms result in e cient colonization of surfaces, Biophysical Journal 103(3), 601-609.

Richard Gejji, Pavel Lushnikov and Mark Alber [2012], Macroscopic model of self-propelled bacteria swarming with regular reversals, Physical Review E 85, 021903 (highlighted in Faculty of 1000).


Cameron W. Harvey, Faruck Morcos, Christopher R. Sweet, Dale Kaiser, Santanu Chatterjee, Xiaomin Lu, Danny Chen and Mark Alber [2011], Study of elastic collisions of M. xanthus in swarms, Physical Biology 8, 026016.


Lushnikov, P.P., Chen, N., and M.S. Alber [2008], Macroscopic dynamics of biological cells interacting via chemotaxis and direct contact, Phys. Rev. E. 78, 061904 (highlighted in the Faculty of 1000 Biology).


B. Positions and Honors

Positions and Employment
Summer 1990  Instructor, University of Pennsylvania
1990 – 1996  Assistant Professor, Department of Mathematics, University of Notre Dame (UND)
1993–1994  On Sabbatical leave at UC Berkeley and Mathematical Sciences Research Institute (MSRI) and Institute for Advanced Study, Princeton, NJ
Summer 1993  Visiting Fellow, Fields Institute for Research in Mathematical Sciences, Canada
June 1994  Visiting Scientist, CNLS, Los Alamos National Lab., NM
1995, 1996  Visiting Fellow, Hewlett-Packard Research Lab., Bristol, UK
1996 – 2001  Tenured Associate Professor, Department of Mathematics, UND
1997 – 2012  Member of the Executive Committee of the Notre Dame Center for Applied Mathematics
2000 – 2001  Sabbatical leave at Stanford University, Palo Alto, CA
2001  Senior Fellow, Institute for Pure and Applied Mathematics (IPAM), UCLA
2001 – 2006  Professor, Department of Mathematics, UND
2001-2002  Associate Director, Interdisciplinary Center for the Study of Biocomplexity (ICSB), UND
2002 –  Director, ICSB, UND
2003 –  Concurrent Professor, Department of Physics, UND
2006 – 2007  Member of the University of Notre Dame Graduate Council, UND
2006 – 2009  Notre Dame University Professor of Applied Mathematics, UND
2009 –  Vincent J. Duncan Family Professor of Applied Mathematics, UND
2012 –  Concurrent professor of Computer Science and Engineering, UND
2013 – 2015  Director of graduated studies, Department of Applied and Computational Mathematics and Statistics, UND
2016 –  Distinguished Professor of Mathematics, University of California, Riverside (UCR)

Other Experience and Professional Memberships
2008 – 2012  Member of the Editorial Board, Journal of Statistical Physics
2010 –  Review Editor of Frontiers in Computational Physiology and Medicine
2010 –  Member of the Committee of the American Mathematical Society (AMS) on Human Rights of Mathematicians
2013 – 2016  Representative of the AMS to the AAAS Human Rights Coalition (HRC) and member of the Council of the HRC
2011 – 2013  Member of the Editorial Board, PLoS Computational Biology
2009 – 2016  Member of 9 NIH Panels and 3 NSF Panels
2010 –  Member of the Editorial Board, Bulletin of Mathematical Biology
2013 –  Deputy Editor, PLoS Computational Biology

Honors
2006 – 2009  Notre Dame University Professor of Applied Mathematics, UND
2011 –  Elected Fellow, American Association for the Advancement of Science (AAAS)
2009 – 2016  Vincent J. Duncan Family Professor of Applied Mathematics, UND
2013  Distinguished Lecture in Applied Mathematics, U of Massachusetts, Amherst, MA
2016  Keynote Speaker, 8th International Bio-fluid Mechanics Symposium, Caltech, Pasadena, CA
2016 –  Distinguished Professor of Mathematics, University of California, Riverside (UCR)
C. Contribution to Science

My research focussed on coupling multi-scale modeling and experiments to generate new biologically relevant hypotheses for the following main projects.

Combined multi-scale modeling and experimental study of blood clot formation

Unlike current experimental approaches that can only explore the effects of one or two components, an interplay between experiment and a validated simulation of thrombogenesis could provide a framework to study the complex network of factors and processes involved in thrombus development. We developed in Sweet et al. [2011] and Wu et al. [2014] two and three-dimensional multi-scale models coupling detailed submodels for cells and blood and used them to simulate receptor-mediated adhesion of deformable platelets at the site of vascular injury under different shear rates of blood flow. Fibrin is a protein polymer that forms a 3D filamentous network, a major structural component of protective physiological blood clots as well as life threatening pathological thrombi. It plays an important role in wound healing, tissue regeneration and is widely employed in surgery as a sealant and in tissue engineering as a scaffold. The network permeability and the protein diffusivity were shown in Kim et al. [2013] to be important factors determining the transport of proteins through the fibrin network. Rheological measurements described in Kim et al. [2014] revealed nonlinear changes of fibrin network viscoelastic properties under dynamic compression, resulting in network softening followed by its dramatic hardening.


1. Oleg V. Kim, Rustem I. Litvinov, John W. Weisel and Mark S. Alber [2014], Structural basis for the nonlinear mechanics of fibrin networks under compression, Biomaterials 35, 6739-6749.

1. Oleg V. Kim, Zhiliang Xu, Elliot D. Rosen and Mark S. Alber [2013], Fibrin Networks Regulate Protein Transport during Thrombus Development, PLoS Computational Biology 9 (6), e1003095.


Multi-scale modeling of early chicken limb development

Developing organs have both discrete and continuous aspects; they may undergo changes according to deterministic or stochastic rules. Some embryonic tissues are planar and can be approximated as 2D sheets, whereas other tissues are space-filling and inherently 3D. Some developmental processes are synchronized over a spatial domain whereas others sweep across a region over time. In some cases, one developmental process will relax much faster or much slower than another, so that the two can be treated essentially independently of one another. In other cases, the only accurate representation is to treat the processes as mutually determinative and conditioning. Each of these possibilities presents a distinct problem for the modeler, and it is becoming increasingly clear that a fully satisfactory model for the development of any living organ must embody all of them. That is, it will be inescapably hybrid, mathematically and computationally. We developed a multi-scale simulation environment [Cickovski et al. 2005, 2007, Zhu et al. 2010 and Zhang et al. 2013] of a chicken limb and used it to simulate cell rearrangement as an individual based module in the presence of morphogen fields and cell-state transition rules based on simplifications of system of equations described above. This strategy permitted us to generate 3D simulations with authentic developmental properties.


Combined multi-scale modeling and experimental study of spread of infection

_Pseudomonas aeruginosa_ is an opportunistic pathogen responsible for both acute and persistent infections in susceptible individuals, as examples by those for burn victims and people with cystic fibrosis. A key aspect of these infections is the formation of bacterial swarms, which are surface-associated, socially organized communities of cells. We developed biologically justified cell-based multi-scale models to generate and test hypothesized mechanisms leading to pathogen _P. aeruginosa_ swarming observed in experiments. In the recent paper [Anyan et al. 2014, PNAS] we combined laboratory and computational methods to probe the physical interactions of Type IV pili (TFP) during flagellar-mediated swarming and found that TFP of one cell strongly interact with TFP of other cells, which limits swarming expansion rate. Hence, wild-type _P. aeruginosa_ use cell–cell physical interactions via their TFP to control self-organization within motile swarms. This collective mechanism of cell–cell coordination using TFP allows for moderation of swarming direction of individual cells and avoidance of a toxic environment.

2. Huijing Du, Zhiliang Xu, Morgen Anyan, Oleg Kim, W. Matthew Leevy, Joshua D. Shrout and Mark Alber [2012], High density waves of the bacterium _Pseudomonas aeruginosa_ in propagating swarms result in efficient colonization of surfaces, Biophysical Journal 103(3), 601-609.

Study of the interplay of motility mechanisms during swarming of _Myxococcus xanthus_

The main goal of this interdisciplinary project is to combine simulations using new three-dimensional multi-scale modeling environment and specifically designed experiments to study basic coordination events of _M. xanthus_ swarming, which is essential to understanding how millions of bacteria function in real environments. Research program focuses on the role of flexibility of cells, viscosity of extracellular polysaccharide, slime adhesivity and directional reversals in resolving collisions, increasing alignment and optimizing swarming rate for _M. xanthus_. In particular, we demonstrated in Harvey et al. [2014] (J. Bacteriol.) interconnection of division, motility, and polarity for the bacterium _Myxococcus xanthus_.


Experimental and computational studies of MT dynamics and regulation by binding proteins

The long-term goal of this collaborative project is to develop a comprehensive understanding of MT dynamics and its regulation by MT binding proteins though a coordinated program of multiscale computational modeling and experiment. The specific goals of this project are to 1) use combined experiment and modeling to establish fundamental principles for how groups of MTBinding Proteins (MTBPs) work together; 2) define the relationship between the behavior of the bulk polymer and that of the individual MTs, and 3) develop freely available software packages to allow students and researchers at remote sites to use our models. In particular, in the papers Gupta
et al. [2013] (PNAS) and Li et al. [2014] (Soft Matter) we introduced two models for studying the catastrophe-promoting activity of the microtubule destabilizer Op18/stathmin and to study in detail to investigate the connection between cracks and MT dynamic instability.


Complete List of Published Work in MyBibliography:
http://www.ncbi.nlm.nih.gov/sites/myncbi/1Xi9sryY5mXkT/bibliography/50131426/public/?sort=date&direction=ascending

D. Research Support

Ongoing Research Support
U01 HL116330 Alber (PI) 07/26/2014 - 07/30/2019
Multiscale modeling and empirical study of a mechanism limiting blood clot growth. This interdisciplinary collaborative project integrates multiscale modeling and experiments to examine novel hypothesis related to the role of fibrin networks in processes halting thrombus growth. This will help physicians to estimate risk of thrombotic disease for an individual patient by identifying critical values of parameters of processes regulating thrombogenesis.

R01GM095959 Alber (PI) 04/01/2012 - 12/31/2016
Combined multiscale modeling and experimental study of bacterial swarming. A key aspect of bacterial infections is the formation of bacterial swarms, which are surface-associated, socially organized communities of cells. This combined multiscale modeling and laboratory study of bacterial behavior on surfaces will provide new critical information needed for the eradication, prevention and treatment of the P. aeruginosa infections.

NSF Grant CBET-1403887 Zartman (PI), Alber and Hoelzle (Co-PIs) 05/01/14 - 04/30/17
Decoding organ-level intercellular signaling in an active, regulated microenvironment. The team develops novel biophysical methods combined with computer simulations for testing novel hypothesis that intercellular calcium waves encode information on the size, differentiation state and overall physiology of epithelia.

NSF grant MCB-1244593 Goodson (PI), Alber (Co-PI) 2017 07/01/13 - 06/30/17
BioMaPS: Experimental and Computational Studies of Microtubule Dynamics and Regulation by Binding Proteins. The long-term goal of this collaborative project is to develop a comprehensive understanding of MT dynamics and its regulation by MT binding proteins though a coordinated program of multiscale computational modeling and experiment.

Recently Completed Research Support
R01GM100470 Alber (PI) 06/01/11 - 06/01/14
Study of the interplay of motility mechanisms during swarming of Myxococcus xanthus. The main goal of this interdisciplinary project was to combine simulations using new three-dimensional multiscale modeling
environment and specifically designed experiments to study basic coordination events of *M. xanthus* swarming, which is essential to understanding how millions of bacteria function in real environments.

NSF grant MCB-0951264 Goodson (PI), Alber (Co-PI) 03/15/10 - 03/15/13
Cellular Organization, Computational and Experimental Studies of Microtubule Dynamics and Regulation by Binding proteins. The project resulted in development of a multi-scale MT model and getting predictive and quantitative understanding of the MT cytoskeleton and its regulation by MTBPs.

NSF Grant DMS-0800612 Alber (PI) 09/01/08-09/01/11
Integrating Multiscale Modeling and in vivo Experiments for Studying Blood Clot Development, The focus of this project was on studying interplay and impact of viscous, incompressible blood plasma, activated and non-activated platelets, as well as other blood cells, activating chemicals, fibrinogen and vessel walls on the internal structure of the developing blood clot.
John P Barton

Postdoctoral Researcher
Massachusetts Institute of Technology
Ragon Institute of MGH, MIT & Harvard
Adviser: Arup K Chakraborty
2012 - 2016

PhD, Physics
Rutgers, The State University of New Jersey
Adviser: Joel L Lebowitz
2006 - 2012

BS, Physics & Mathematics
Duke University
Magna cum laude
Honors thesis adviser: M Ronen Plesser
2002 - 2006

Research Interests
I use methods from statistical mechanics and machine learning to study pathogen evolution and human immunity. I am particularly interested in highly mutable pathogens such as HIV, and the dynamical interactions between microbes and the immune system.

Publications


● Part of the special issue “Information Processing in Living Systems”


● Awarded MIT Postdoctoral Association Travel Grant, APS March Meeting

● Highlighted on the MIT Postdoctoral Association website


* Equal contributions † Co-corresponding authors


- Part of the special issue "Statistical Physics and Neuroscience"


- Included in the Journal of Physics A Highlights of 2011 collection


Chakraborty AK, Barton JP. Rational design of effective vaccine targets and strategies for HIV: a crossroad of statistical physics, biology, and medicine. Submitted.


Invited talks 116th Statistical Mechanics Conference, Rutgers University

Initiative for the Theoretical Sciences, CUNY (declined for family reasons)

Department of Microbiology, University of Pennsylvania School of Medicine

Coevolution in Proteins and RNA, Theory and Experiments Workshop

Keystone Systems Immunology Meeting (short talk selected from abstracts)

2015 Systems Immunology Workshop,

Cincinnati Children’s Hospital Medical Center

Mathematical Physics Seminar, Rutgers University

Center for Biophysics and Computational Biology, Temple University

Keystone HIV Vaccines Meeting (short talk selected from abstracts)

Monday Meeting, Ragon Institute of MGH, MIT and Harvard

2014 Institute for Advanced Study Focused Program on Computational and Experimental Immunology, Hong Kong University of Science and Technology

Monday Meeting, Ragon Institute of MGH, MIT and Harvard

2013 Harvard Microbial Evolution Group, Harvard University
Contributed presentations

2016
IMES Research Progress Meeting
Koch Institute Immune Engineering Symposium, MIT
APS March Meeting

2015
Forecasting Evolution Conference (short talk invitation declined)
Third Annual Winter Q-Bio Meeting

2014
112th Statistical Mechanics Conference, Rutgers University
MIT Biophysics Retreat
MIT-MGH Meeting on IBD, Microbiome and Autoimmune Disease

2013
First Annual Winter Q-Bio Meeting

2012
108th Statistical Mechanics Conference, Rutgers University
107th Statistical Mechanics Conference, Rutgers University

2011
106th Statistical Mechanics Conference, Rutgers University

Honors & Awards

eLife Early-Career Reviewer (2016)
Lindau Nobel Laureate Meeting Attendee, Siemens AG Fellow (2015)
MIT Postdoctoral Association Travel Grant (2014)
Rutgers University Departmental Graduate Assistantship (2010, 2012)
GAANN Fellowship, Rutgers University (declined)
Phi Beta Kappa, National honor society
Sigma Pi Sigma, National physics honor society
Phi Eta Sigma, National honor society

Teaching Experience

Teaching assistant, Honors Physics III (Physics 273), Rutgers University (2011)
Senior teaching assistant, Extended General Physics (Physics 201), Rutgers University (2010)
Teaching assistant, Extended General Physics (Physics 201/202), Rutgers University (2006 - 2009)
Teaching assistant, General Physics I-II (Physics 52L-54L), Duke University (2003 - 2004)
References

Arup K Chakraborty
Departments of Chemical Engineering, Physics, Chemistry, & Biological Engineering, Institute for Medical Engineering & Science, Massachusetts Institute of Technology
arupc@mit.edu
(617) 253 – 3890

Mehran Kardar
Department of Physics
Massachusetts Institute of Technology
kardar@mit.edu
(617) 253 – 3259

Joel L Lebowitz
Departments of Physics & Mathematics
Rutgers, The State University of New Jersey
lebowitz@math.rutgers.edu
(732) 445 – 2411 x 6025

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Nuffield Department of Medicine
University of Oxford
andrew.mcmichael@ndm.ox.ac.uk
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Simona Cocco
Laboratoire de Physique Statistique
École Normale Supérieure
cocco@lps.ens.fr
(+33) 1 44323371
Gegor M. Blaha  
*Assistant Professor of Biochemistry*

5489 Boyce Hall, University of California, Riverside, CA 92521
Phone: (951) 827-3832, Fax: (951) 827-4294, email: gregor.blaha@ucr.edu

**Professional Preparation**

University of Vienna, Austria  
Chemistry/Chemistry  
Mag.rer.nat., 1997

Vienna University of Technology, Austria  
Technical Sciences  
Dr. techn., 2001

Yale University, New Haven, CT  
Macromolecular Crystallography  
2001 – 2008

**Appointments**

2012- Present  
University of California, Riverside, Assistant Professor, Department of Biochemistry

2008-2011  
Yale University, New Haven, CT, Research Associate

2001-2008  
Yale University, New Haven, CT, Postdoctoral Fellow

2001  
Max Planck Institute for Molecular Genetics, Berlin, Germany, Postdoctoral Fellow

**Five Relevant Publications**


**Other Significant Publications**


**Synergistic Activities**

Faculty mentor for the Minority Access to Research Careers - Undergraduate Student Training in Academic Research (Marc U*), the Louis Stokes California Alliance for Minority Participation in Science, Engineering and Mathematics (CAMP), and Summer Research in Science and Engineering program at UCR (RISE).

Faculty advisor for high school students (UCR discovery day, 2011-present), graduate students (microbiology graduate program, 2013), and post-doctoral researchers (UCR Career Day, 2012).

Co-organizer of the 2014 and organizer of the 2016 Biochemistry Summer Academy High School Teachers

Science Fair Judge for Riverside Unified School District and for the Riverside, Inyo, Mono, and San Bernardino counties competitions.

Advised and consulted in the development of an alignment tool for high throughput capillary mounting of protein crystals (MiTeGen LLC, Ithaca, NY; 2010-2011 URL: http://www.mitegen.com/products/micrort/micrort.shtml.)
CURRICULUM VITAE

Richard A. Cardullo, Ph.D.
Department of Biology
The University of California
Riverside, California 92521
Ph: (951)-827-6457
FAX: (951)-827-4286
e-mail: cardullo@ucr.edu

ACADEMIC POSITIONS

2014 – present  Associate Vice Provost, Undergraduate Education, University of California, Riverside
2014 – present  Howard H Hays Jr Chair, University Honors, University of California, Riverside
2012 – 2014  Honors Faculty Member, University of California, Riverside
2009 – 2012  Divisional Dean of Life Sciences, College of Natural and Agricultural Sciences, University of California, Riverside
2004 – 2009  Chair, Department of Biology, University of California, Riverside
2006 - present  Distinguished Teaching Professor of Biology, University of California, Riverside
2002 – present  Professor of Biology, University of California, Riverside
1996 – 2002  Associate Professor of Biology, University of California, Riverside
1991 - 1996  Assistant Professor of Biology, University of California, Riverside
1987 - 1991  Senior Research Associate
The Worcester Foundation for Experimental Biology, Shrewsbury, MA
1985 - 1987  Postdoctoral Fellow
Department of Anatomy and Cellular Biology, Harvard Medical School

EDUCATION
Department of Biophysics, The Johns Hopkins University, Baltimore, Md.
Advisor: Dr. Richard Cone

1979 - 1981  M.S. Physics, May 1981
Department of Physics, University of Massachusetts, Amherst

1976 - 1979  B.S. Physics (concentration in Biophysics), April 1979
Department of Biophysics, University of Michigan, Ann Arbor
AWARDS, FELLOWSHIPS, AND HONORS
1981 - 1985 NIH predoctoral fellowship at Johns Hopkins
1984 - 1985 Dean’s fellowship at Johns Hopkins
1987 NIH training grant at Harvard in Reproductive Biology
1987 - 1988 NIH training grant at the Worcester Foundation in Cell Biology
1988 - 1990 NIH National Research Service Award recipient
1991 Recipient, James Shannon Award (NIH)
1998 Organizer and International Advisor for VIII International Congress of Spermatology
1999 UCR Distinguished Teaching Award
1999-2001 President, UCR Chapter of Sigma Xi
2000 Visiting Professor, Scripps Oceanographic Research Institute
2003 Vice Chair, Gordon Conference on Fertilization and Activation of Development
2005 Chair, Gordon Conference on Fertilization and Activation of Development
2006 HHMI/National Academy of Sciences Teaching Fellow in the Life Sciences
2006 Awarded title of Distinguished Teaching Professor at UC-Riverside
2007 HHMI/National Academy of Sciences Teaching Mentor in the Life Sciences
2009-present Chair, Board of Directors, Biological Sciences Curriculum Study
2012-present HHMI/NIH/NSF Vision & Change Fellow
2012-present Executive Committee and Council, AAAS - Pacific Division
2013-2015 President, American Association for the Advancement of Science - Pacific Division
2014 Visiting Professor, Department of Molecular Biology and Genetics, Cornell University
2014-present Howard H Hays Jr. Endowed Chair, University Honors, UC-Riverside

EXTRAMURAL GRANT AND AWARD HISTORY
Glycosylation events during spermatogenesis in the mouse, R.A. Cardullo, Principal Investigator National Institutes of Health, National Research Service Award, April, 1988 - May 1990

James Shannon Award, R.A. Cardullo, Principal Investigator
National Institutes of Health (NICHD), R55 HD27244, $100,000, October, 1991 - July, 1992

Receptor dynamics during fertilization in the mouse, R.A. Cardullo, Principal Investigator
National Institutes of Health (NICHD), RO1 HD27244, $527,834, August, 1992 - present

Development of an optical microscope for the simultaneous measurement of ligand-receptor dynamics and signal transduction pathway in living cells, R.A. Cardullo, Principal Investigator
The Whitaker Foundation, Biomedical Research Grant, $234,388, June, 1992 - May 1995


Carbohydrate determinants during fertilization, R.A. Cardullo, Principal Investigator

Graduate Assistance in Areas of National Need, R.A. Cardullo, Program Director

Mathematical Achievement through Collaboration with Teachers and Students, R.A. Cardullo, Principal Investigator, National Science Foundation, $5,200,000, November, 2002 – October, 2007.
Graduate Assistance in Areas of National Need, R.A. Cardullo, Program Director
The Department of Education, Biology Training Grant, $809,000, October, 2003 - September, 2008.

Mathematical Achievement through Collaboration with Teachers and Students, R.A. Cardullo, Principal Investigator, National Science Foundation, $199,000, November 2007 – October 2009.


California Alliance for Minority Participation in STEM Fields, R.A. Cardullo, Principal Investigator, National Science Foundation, $450,000, July 2011 – June 2016.

LSAMP Bridge to the Doctorate Training Grant, R.A. Cardullo, Principal Investigator, National Science Foundation, $987,000, July 2011 – June 2014.


Phenotypic Responses of the Lung to Hypoxia in Deer Mice Living at High Altitude, R.A. Cardullo, Principal Investigator, National Science Foundation, $480,082, January 2015 – December 2017.

Molecular Dissection of Sperm Motility: MAPK Targets and Control of Waveform, R.A. Cardullo, co-Principal Investigator, National Institutes of Health, $1,480,949, January 2017 – December 2020, Pending.

PUBLICATIONS


Thaler, C.D., Miyata, H., Haimo, L.T., and Cardullo, R.A. 2013. Waveform generation is controlled by


PATENTS


TEACHING
Undergraduate
Biochemistry 100 (Introductory Biochemistry), 2015
Biology 2 (Cellular Biology for non-majors), 2005, 2008-2010
Biology 5B (Introduction to Organismal Biology), 2003-2007, 2010-2013
Biology 110 (Biology of Human Problems), 2001, 2003, 2004
Biology 111 (Cell Biology), 1997-1999
HNPG 1A (Transition of an Honors Student), 2014
HNPG 15 (Honors Ignition Seminar on the Nature of Discovery and Creativity), 2012, 2013
HNPG 15 (Honors Ignition Seminar on Drivers of Change), 2014
HNPG 15 (Honors Ignition Seminar on the Anthropocene)
HNPG 150 (Introduction to Research), 2012, 2013, 2015
HNPG 151 (Honors Research Seminar), 2013, 2015
NASC 93 (Freshman Advising Seminar), 2010, 2011
Graduate
Biology 200A (Graduate Course in Cellular Biology), 1995
Biology 303 – (Philosophy and Pedagogy of Teaching Undergraduate Life Science) 2010, 2012
Various topical graduate seminars, approximately 1 per year

Postgraduate
Analytical and Quantitative Light Microscopy at MBL (Woods Hole), 1990 to 2010.
HHMI/National Academy of Life Sciences Summer Institute (Madison, WI), 2007

CURRENT GRADUATE STUDENTS
Carla del los Santos, Ph.D. Candidate (Bioengineering)
Kimberly Stephens, Ph.D. Candidate (Entomology)
Nathan Robinett, Ph.D. Candidate (Evolutionary Biology, joint doctoral program San Diego State University)
Nhi Tran, M.S. Candidate (Biochemistry)

COMPLETED GRADUATE AND POSTGRADUATE STUDENT TRAINING
Graduate Students:
Eric Alm, M.S (Biology)
Cathrine Castillo, M.S. (Cell, Molecular, and Developmental Biology)
Qin Chen, M.S. (Biology)
Alejandro Cortez, M.S. (Biology)
Juan Fraire-Zamora, Ph.D. (Evolution, Ecology, and Organismal Biology)
Scott Herrick, Ph.D. (Biology)
Ruei-Shuian Lin, Ph.D. (Biology)
Haruhiko Miyata, Ph.D. (Evolution, Ecology, and Organismal Biology)
Joya Paul, M.S. (Biology)

In addition I have served on 63 Ph.D. qualifying examination committees, 36 Ph.D. student advisory committees, 19 Ph.D. dissertation committees, and 14 M.S. thesis committees in various graduate programs.

Postdoctoral Fellows:
Lisa A. Fast, Ph.D.
Juan Fraire-Zamora, Ph.D.
Catherine D. Thaler, Ph.D.

PROFESSIONAL SERVICE
Member, Organizing Committee for International Congress on Spermatology, 1998
Vice Chair, Gordon Research Conference on Fertilization and the Activation of Development, 2003
Chair, Gordon Research Conference on Fertilization and the Activation of Development, 2005
Associate Editor, Molecular Reproduction and Development, 2009 – present
Editor, International Journal of Biochemistry and Molecular Biology, 2010 – present
Editor, American Journal of Molecular Biology, 2011-presenter

Scientific Society Membership
American Association for the Advancement of Science, American Society for Cell Biology, Biophysical Society, Sigma Xi, Society of General Physiologists, Society for the Study of Reproduction.

**Manuscript Reviews**

**Grant Reviews**
Reviewer, Jeffress Research Grant (1993)
Outside Reviewer, NSF (1994 - 2011)
Reviewer, South Plains Foundation (1996)
Panel Member, Shared Instrumentation Grants for Confocal Microscopy, NIH (1996)
Site Visit Member, Program Project Grant in Reproductive Biology at Stanford, NIH (1996)
Panel Member, Cellular and Molecular Imaging Study Section, NIH (2003)
Panel Member, Novel Contraceptive Methods, NIH (2003)
Site Visit Member, Comprehensive Math Science Partnerships, NSF (2003)
Panel Member, Cellular, Molecular and Integrative Reproduction Study Section, NIH (2011, 2013, 2016)
Panel Member, Louis Stokes Alliance for Minority Participation Centers, NSF (2011)
Panel Member, R15 Special Emphasis Panel, NIH (2013)
Panel Member, IUSE, NSF (2014)

**Invited Talks**
1985 Department of Anatomy and Cellular Biology, Harvard Medical School
1986 Department of Biophysics, Johns Hopkins University
     Boston Area Cell Motility Club, Harvard University
1987 Department of Biology, Boston University
     Laboratory of Human Reproduction and Reproductive Biology, Harvard Medical School
     Beth Israel Hospital, Boston
     Department of Anatomy and Cell Biology, Duke University
     Department of Anatomy, Yale University
1989 American Society of Cell Biology, Subgroup meeting on Ligand -induced exocytosis
1990 Department of Physiology, The University of Texas Southwestern at Dallas
     VI International Congress on Spermatology, Siena, Italy
1991 Department of Biochemistry, Georgetown University
     Department of Cell and Developmental Biology, Harvard University
     Department of Biology, The University of California - Riverside
     Division of Reproductive Biology, The University of Pennsylvania Medical School
     Gordon Conference on Fertilization and the Activation of Development
1992 Loeb Biomedical Research Institute, Ottawa, Canada
     Boston Biomedical Research Institute
1993 Department of Biophysics and the Beckman Laser Institute, Univ. of California - Irvine
Symposium, annual meeting of the Society for the Study of Reproduction, Fort Collins
Genetics Program, University of California - Riverside
1994 Department of Biology, Pomona College
Department of Chemistry, University of California - Riverside
Department of Cell and Molecular Biology, Loma Linda University Medical School
1995 Department of Cellular Biology, The University of California - Davis
Department of Cell and Molecular Biology, Loma Linda Medical Center
Gordon Conference on Fertilization and the Activation of Development
Department of Biology, California State University, Fullerton
1996 Department of Cellular and Developmental Biology, The University of California - Santa Barbara
Department of Biochemistry, The University of California - Riverside
1998 Department of Physics, The University of California - Riverside
NSF Conference on Computing in Life Sciences, Claremont, CA
Department of Anatomy and Cell Biology, Tufts University Medical School, Boston, MA
VIII International Congress on Spermatology, Montreal, Canada
Department of Biomedical Sciences, The University of California-Riverside
1999 Departments of Biology and Physics, Occidental College
2000 Department of Biochemistry, Texas Tech University, Lubbock
2002 Department of Molecular Biology and Biochemistry, Johns Hopkins University
Department of Veterinary and Animal Sciences and Biology, University of Massachusetts
Department of Biology, University of California, Riverside
2003 Gordon Conference on Fertilization and Activation of Development
“How People Learn for developing courses and curricula” National Research Council, Washington, D.C.
2004 Department of Biological Sciences, Notre Dame University
2005 Gordon Research Conference on Fertilization and Activation of Development
2007 Center for Conservation and Research for Endangered Species, San Diego
2008 Keynote speaker, Math Science Partnership Conference (NSF), Washington, D.C.
2009 Annual Meeting for the American Society for Cell Biology, San Diego, CA
National Evolutionary Synthesis Center, Durham, NC
2010 College of Science and Mathematics, Wright State University, Dayton, OH
Cellular Dynamics Program, Marine Biological Laboratory, Woods Hole, MA
2011 Gordon Conference on Fertilization and Activation of Development
Beckman Center, City of Hope, Duarte, CA
International Relations, California State University, Fullerton, CA
Molecular Genetics Graduate Program, Loma Linda University
2012 American Society for Andrology Annual Meeting, Tucson, CA
Department of Obstetrics and Gynecology, University of Pennsylvania, Philadelphia, PA
2013 Department of Biology, California Lutheran University, Thousand Oaks, CA
Department of Veterinary and Animal Sciences, University of Massachusetts, Amherst, MA
2014 Department of Cell Biology and Biochemistry, Texas Tech University, Lubbock, TX
Department of Anatomy and Cell Biology, Kansas University Medical Center, Kansas City, KS
UCR Citizens University Committee, Riverside, CA
Department of Molecular Biology and Genetics, Cornell University, Ithaca, NY
Department of Biological Sciences and the RNA Institute, University of Albany, NY

DEPARTMENTAL COMMITTEES
Member, Electron Microscopy Committee, 1992 – 1994
Co-chair, Seminar Committee, Winter, 1993; Fall, 1993; Fall, 1994; Fall 1995, Fall, 1997, Fall, 1998
Chair, Computer Committee, 1991 – 2002
Member, Graduate Advisory Committee, 1993 – present
Editor, Graduate Brochure, 1994 – 1995
Graduate Poster in Cell and Molecular Biology, 1995
Faculty Advisor, Cell and Molecular Ph.D. Qualifying Examination, 1995
Graduate Advisor, Department of Biology (Recruitment), 1996 – 1999
Chair, Space Committee, 1998-2003
Graduate Advisor, Department of Biology (Continuing Students), 2001 – 2003
Chair, Faculty Search Committee in Developmental Biology, 2001
Chair, Department of Biology, 2004 – 2009
Editor, Biology Department Newsletter, 2006 - 2010
Faculty Advisor, Physiology Ph.D. Written Qualifying Examination, 2007
Chair, Development committee, 2008 – present
Chair, EEOB Graduate Program Teaching Committee, 2010 – 2013
Chair, Biology Curriculum Committee, 2014 - present

CAMPUS COMMITTEES
Member, Academic Computer Committee, 1992 – 1994
Chair, Academic Computer Committee, 1995 – 1996
Member, Institute for Molecular Biomedical Research Planning Committee, 1993 – 1995
Member, Strategic Planning Subcommittee for College of Natural and Agricultural Sciences, 1994
Member, Scholarship Committee, 1996 - 1999
President, Riverside Chapter of Sigma Xi, 1998 - 2000
Member, Graduate Program Reorganization Committee, 1996 - 1997
Member, Academic Senate Educational Policy Committee, 1997 - 2000
Vice Chair, Academic Senate Educational Policy Committee, 1998 - 2000
Member, Distinguished Teaching Committee, 2002 – 2005
Member, Life Science Committee of Chairs, 2004 - 2009
Member, Committee on Committees, 2006 – 2009
Member, Academy of Distinguished Teachers, 2006 – 2011
Co-Chair, Search Committee for Endowed Chair in Innovative Teaching Across Disciplines, 2007
Member, General Education Planning Committee, 2007
Member, School of Medicine Curriculum Planning Committee, 2007
Member, Academic Senate General Education Committee, 2008 - 2011
Chair, Academic Senate Committee on Committees, 2008 - 2009
CNAS Faculty Representative, Campus Budget Advisory Committee, 2009 - 2010
Member, University Strategic Planning Committee on Community Engagement, 2009 – 2010
Member, Academic Senate Committee on Academic Personnel, 2014
Member, Academic Senate Committee on International Education, 2014 -

UNIVERSITY COMMITTEES
Representative, Information Technology and Telecommunication Policy, 1995 - 1996
Member, Teaching and Learning Technologies and the Future of the University, 1997
Member, UC System-wide Committee on Committees, 2008 - 2009

PUBLIC SERVICE AND OUTREACH
Provider, School University Partnership Teacher In-service, Alvord Unified School District, 1997-2001
Member, Board of Directors, Inland Empire Chapter Juvenile Diabetes Research Foundation, 1998 - 2001
Coordinator, Riverside Unified School District Science Fair, 1999 - 2002
Judge, Riverside Unified School District Science Fair, 1995 - present
Coordinator, Weekly Summer Science Institute for Teachers and Students at UCR, 1999 - 2008 (Project ALIAS)
Judge, Alvord Unified School District Science Fair, 1998 - 2001
Judge, Jurupa Unified School District Science Fair, 2002 - 2007
Judge, California State Science Fair (Biochemistry), 2004, 2006
Judge, California State Science Fair (Zoology), 2005
Coordinator, 2-week Summer Science Institute for Teachers and Students in Ontario-Montclair Unified School District (Project POSE), 2009 – 2012
Coordinator, 2-week Summer Science Institute for Teachers in Riverside County (Project SCAN), 2011-2014
Chia-en A. Chang
April, 2016

Department of Chemistry,
University of California, Riverside
Phone: 951-827-7263
Email: chiaenc@ucr.edu
http://www.chem.ucr.edu/chang

Research Interests
• Non-covalent binding kinetics and thermodynamics
• Modeling and design of multi-enzyme complexes for enhanced catalysis
• Molecular recognition and protein dynamics
• Physical chemistry and statistics mechanism of biomolecules
• Computer-aided drug and peptide inhibitor design

Employment
• Associate Professor, Department of Chemistry, University of California, Riverside, 7/2014 – present.
• Assistant Professor, Department of Chemistry, University of California, Riverside, 2008-2014.

Education and Training
• Postdoctoral research, Department of Chemistry and Biochemistry, University of California, San Diego and HHMI. Advisor: Dr. J. Andrew McCammon, 2/2005-11/2007.
• Graduate School, Ohio State University, Columbus, OH, M.S. Civil and Environmental Engineering, 9/1995-6/1997
• Undergraduate, National Taiwan University, Taiwan, B.S. Plant Biology, 9/1991-6/1995.

Research Recognition and Honors
• Career Award, National Science Foundation, 2014
• Faculty Development Award, University of California, 2012
• Omnibus Travel Award, Academic Senate Research, University of California, 2012, 2014
• Robert T Poe Faculty Development Award, 2009
• HP Outstanding Junior Faculty Award, American Chemical Society, 2009
• Regents’ Faculty Fellowship, University of California, 2008
• Outstanding Graduate Student, University of Maryland Biotechnology Institute, 2003.
• College Travel Award, University of Maryland at College Park, 2002.

Extramural Funding
• National Science Foundation, CAREER: Development and Application of Multi-scale Modeling for Biomolecular Association, 2014-2019
• National Institutes of Health R01 Supplement Equipment Fund: Computational and theoretical characterization of ligand-protein binding mechanism. 2015-2016.
• National Institutes of Health R01 (co-PI; L. Mueller PI): Enhancing Chemically-rich structure and dynamics in the active site of tryptophan synthase, 2011-2016.

Service (selected)
• Member, NSF, NSF BIO/MCB Computational Biochemistry, 2016
• Member, NSF, NSF BIO/MCB Molecular and Cellular Biosciences, 2015
• Member, National Academies of Sciences, Study of Molecular Dynamics 2015
• Member, NIH NIAID Special Emphasis Panel ZA1 Sm-MJ-2 R21/R33 study section, 2013
• Reviewer for NSF, 2009-present, ad hoc.
• Reviewer for ACS petroleum fund, 2011-2012
• Reviewer for Cottrell college science award, 2012
• Oversight Board committee, University of California Shared Research Technology, 2009-2012

Service as referee for the following journals (selected):

Visiting scholars in the group
• Wei Chen, Visiting assistant professor (1/2015 – present)

**Students and postdoctoral researchers advised**

**Current group members:**
• Chris Roberts, Postdoctoral fellow (1/2015 – present)
• Zhiye Tang, Graduate student (9/2011 – present)
• Wanli You, Graduate student (9/2012 – present)
• Mary Raymundo, Graduate student (9/2015 – present)
• Yuliana Bosken, Graduate student (9/2015 – present)
• Viktoriai Liu, Graduate student (7/2016 – present)
• Tim Cholko, Graduate student (8/2016 – present)
• Jennifer Clark, undergraduate (9/2014 – present)

**Former group members:**
• Safieh Ladani, Postdoctoral fellow (4/2015 – 4/2016)
• Xuqing Liu, Master student (9/2014 – 4/2016)
• Steven Ahrendt, Graduate student (9/2010 – 6/2015, UC Berkeley)
• Chris Roberts, Graduate student (6/2010 – 12/2014, UCR)
• Mindy Huang, Graduate student (9/2009 – 8/2014, UCSD)
• Rizi Ai, Graduate student (1/2008 – 8/2012, UCSD)
• Myungshim Kang, Postdoc (9/2009 – 2/2013, CUNY)
• Lawrence Pointer, undergraduate (1/2013 – 6/2013)
• Sean Jayasekera, undergraduate (9/2012 – 6/2013)
• Jaspreet Kaur, undergraduate (Summer 2011)
• Sepideh Yaghmaeim, Postdoc (2/2011– 12/2011, community college lecturer)
• Qaiser Fatmi, Postdoc (6/2008 – 10/2010, Quaid-e-Azam University in Pakistan)
• Alfonso Lam, Postdoc (7/2008 – 6/2009, subsequently, UC, Irvine)
• Kirmanj Atrushi, undergraduate (Summer 2008)
• Kevin Kim, undergraduate (Summer 2010)
• Shivali Gowda, Georgette Sabbah and Ashraf Sabbah, High school students (summer 2013)
• Apoorva Panse, high school student (6/2012 – 5/2014, UCLA)
• Alejandro Cabian, undergraduate (6/2013 – 9/2014, high school teacher)

**Invited Talks (recent and selected)**
• *Modeling molecular recognition: from host-guest binding kinetics and thermodynamics to large enzyme nanostructure design*, Institut für Physik, Humboldt Universität zu Berlin, 6/2016.
• *Modeling ligand-protein binding kinetics: the continuous and dynamical processes in...*
• Insights from Drug-Protein Binding Free Energy Calculations: Entropy, Enthalpy and Inhibitor Design, School of Pharmacy, University of Maryland, Baltimore, 5/2016.
• Modeling molecular recognition: multi-scale simulations for ligand-receptor binding processes. Seminar, Sichuan University, Chengdu, China, 10/2015.
• Modeling of enhanced catalysis in multienzyme nanostructures: effect of molecular scaffolds, spatial organization, and concentration. Multiple faces of Biomolecular Electrostatics Workshop, Columbus, OH, 10/2015.
• Simulations of Biomolecular Systems: from small ligand binding affinity prediction to large enzyme nanostructure design. Seminar, School of Chemistry, University of Edinburgh, UK, 6/2015.
• Simulations of Biomolecular Systems: Protein Dynamics, Docking, and Inhibitor Discovery. CEPCEB Symposium, UCR, 12/2014.
• Effect of Spatial Organization and Molecular scaffolds on the Diffusional Activity of substrates in Enzyme Nanostructures. AAAS Regional Meeting, Riverside, CA, 6/2014.
• Binding kinetics Studies for Cryptophane Host-Guest and Ligand-Protein Complexes, CECAM, Genoa, Italy, 6/2014.
• Modeling of Biomolecular Systems: Protein Dynamics, Binding Affinity Calculation, and Inhibitor Design, Seminar, National Taiwan University, 3/2014.
• Insights from Free Energy Calculations: Protein Conformational Equilibrium, Driving Forces and Ligand Binding Processes, Seminar, Georgia State University, 11/2013.
• Insights from Free Energy Calculations, AAAS Regional Meeting, Las Vegas, 6/2013.
• Insights from Free Energy Calculations: Protein Conformational Equilibrium, Driving Forces and Ligand Binding Processes, Laboratory of Computational Biology, NIH, 5/2013.
• Modeling Molecular Association: Diffusion, Gating and Hydrogen-bonding, Florida State University, 4/2013.
• Modeling Molecular Association: Diffusion, Gating and Intermolecular Interactions, UC, Santa Barbara, 10/2012.
• Modeling Molecular Association, Material Science Center, Caltech, 6/2012.
• Modeling Molecular Association: Diffusion, Conformational Changes and Intermolecular Interactions, Laboratory of Chemical Physics, NIH, 3/2012.

Publications (referred, with a few exceptions as noted)


**Publications after joining UCR**


Richard J. Debus  
Professor and Chair  
Department of Biochemistry  
University of California, Riverside

Education and Training

<table>
<thead>
<tr>
<th>Institution</th>
<th>Degree</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>California Institute of Technology</td>
<td>Chemistry</td>
<td>B.S.</td>
</tr>
<tr>
<td>University of California, San Diego</td>
<td>Chemistry</td>
<td>M.S.</td>
</tr>
<tr>
<td>University of California, San Diego</td>
<td>Chemistry</td>
<td>Ph.D.</td>
</tr>
<tr>
<td>MSU-DOE Plant Research Laboratory, Michigan State University</td>
<td>Plant Molecular Biology</td>
<td>Postdoctoral Fellow</td>
</tr>
</tbody>
</table>

Research and Professional Experience

<table>
<thead>
<tr>
<th>Year</th>
<th>Position</th>
<th>Institution</th>
</tr>
</thead>
<tbody>
<tr>
<td>1977-1985</td>
<td>Research Assistant</td>
<td>Departments of Physics &amp; Chemistry, University of California, San Diego</td>
</tr>
<tr>
<td>1985-1988</td>
<td>Postdoctoral Fellow</td>
<td>MSU-DOE Plant Research Laboratory, Michigan State University</td>
</tr>
<tr>
<td>1988-1995</td>
<td>Assistant Professor</td>
<td>Department of Biochemistry, University of California, Riverside</td>
</tr>
<tr>
<td>1995-2001</td>
<td>Associate Professor</td>
<td>Department of Biochemistry, University of California, Riverside</td>
</tr>
<tr>
<td>2001-present</td>
<td>Professor</td>
<td>Department of Biochemistry, University of California, Riverside</td>
</tr>
<tr>
<td>2006-present</td>
<td>Cooperating Faculty Member</td>
<td>Department of Chemistry, University of California, Riverside</td>
</tr>
<tr>
<td>2006-2007</td>
<td>Interim Chair</td>
<td>Department of Biochemistry, University of California, Riverside</td>
</tr>
<tr>
<td>2008-2010</td>
<td>Vice Chair</td>
<td>Department of Biochemistry, University of California, Riverside</td>
</tr>
<tr>
<td>2010-present</td>
<td>Chair</td>
<td>Department of Biochemistry, University of California, Riverside</td>
</tr>
</tbody>
</table>

Honors

Fellow, American Association for the Advancement of Science (Elected 2009)

Publications

Peer-Reviewed Technical Journal Articles (numbering corresponds to that in UCR’s eFile system)


Book Chapters (numbering corresponds to that in UCR’s eFile system)


Review Articles (numbering corresponds to that in UCR’s eFile system)


Edited Journal Articles (numbering corresponds to that in UCRs eFile system)

Abstracts (numbering corresponds to that in UCR’s eFile system)


EXTRAMURAL FUNDING

Past Funding Support

National Science Foundation, MCB 0111065, “Mechanism of Photosynthetic Oxygen Evolution” (R. J. Debus, PI) $360,000 Total Award, 08/01/2001 – 07/31/2004
National Institutes of Health, R01 GM66136; “EP & Optical Studies of Photosynthetic Water Oxidation” (R. J. Debus, PI) $746,467 Total Award, 08/02/2002 – 07/31/2006
National Institutes of Health, R01 GM76232; “FTIR Studies of Photosynthetic Oxygen Evolution” (R. J. Debus, PI) $847,048 Total Award, 07/03/2006 – 05/31/2010
Department of Energy, Office of Energy Biosciences, DE-FG01-10ER16191; “FTIR Studies of Photosynthetic Oxygen Production (R. J. Debus, PI) $499,725 Total Award, 09/01/2010 – 08/31/2013

Current Funding Support

Department of Energy, Office of Energy Biosciences, DE-SC0005291, “FTIR Studies of Photosynthetic Oxygen Production (R. J. Debus, PI) $499,177 Total Award, 09/01/2014 – 08/31/2017

Synergistic Activities (since 2001)

Editorial Board, Photosynthesis Research, 1995-present.
Member, NSF Molecular Biophysics Grant Review Panel, 2001-2002.
Member, NSF Molecular Biochemistry Grant Review Panel, 2002
Vice Chair, Gordon Research Conference on Photosynthesis, 2011
Chair, Gordon Research Conference on Photosynthesis, 2012

Invited Presentations at International Meetings (since 2000)

5. “FTIR Studies of the Water Oxidizing Complex in Photosystem II,” 13th International Congress on Photosynthesis, August 29-September 3, 2004, Montréal, Québec, Canada (Poster and Session Co-Chair of Session Entitled “Type II Reaction Centers: Structure”).


Li Fan

http://biochemistry.ucr.edu/faculty/fan/fan.html

Department of Biochemistry
Boyce Hall 2466
University of California, Riverside
Riverside, CA 92521

Phone: (951)8273630
Fax: (951)8274434
E-mail: lifan@ucr.edu

Education:
Bowling Green State University, Bowling Green, Ohio, M. S. in Chemistry, 1993.
Beijing University, Beijing, China, B. S. in Chemistry, 1987.

Professional Experience:
University of California at Riverside, Department of Biochemistry, Riverside, California
Associate Professor 2016-Present
Assistant Professor 2009-2016
Director of Macromolecular X-ray crystallography core facility 2009-present

The Scripps Research Institute, Department of Molecular Biology, La Jolla, California
Senior Research Associate 2007 - 2008
Research Associate 2000 – 2007

Manuscripts in Preparation (*corresponding author)
1. K. DuPrez, I. Wang, and Li Fan* “Crystal structure of archaeal XPB associated with an endonuclease complex”.
2. Binyuan Zhai, K. Duprez, T. I. Doukov, Jinfeng Ni, Lichuan Gu, Yulong Shen*, Li Fan* “A novel P-loop ATPase conserved in archaea is associated with Holliday junction processing and essential for cell viability”

Manuscripts Submitted (*corresponding author)
1. K. DuPrez, I. Wang, E. Hilario, Li Fan* “ATP-Driven domain rotation in XPB helicase supports a unified DNA unwinding mechanism for transcription and DNA repair”.

Publications (22 listed out of 25, H-index 11) (*corresponding author)

Review articles


Book chapters
Journal articles


"Must read" **Recommended by Faculty of 1000 Biology**

Highlighted by C&E News **Enzyme Structure And Mutations Reveal Disease Roles** ([http://pubs.acs.org/subscribe/journals/cen/86/i23/toc/toc_i23.html#sci](http://pubs.acs.org/subscribe/journals/cen/86/i23/toc/toc_i23.html#sci))


**Recommended by Faculty of 1000 Biology** ([http://www.f1000biology.com/article/16600867.](http://www.f1000biology.com/article/16600867.))


E1. V. A. Roberts and Li Fan (2002). "Predicting DNA/Protein interactions with DOT". *Protein Science*, 11(suppl.1). (Abstract).

**Grants, Honors and Awards**

2015-2020 **NIH grant 1R01GM108893-01A1** "Investigating the role of XPB helicase in DNA nucleotide excision repair" $1,624,416. Sole-PI.
2015-2016 University of California Regents Faculty Development Award ($9,000).

2011-2016 NIH grant R01GM097569 (PI: L. J. Mueller) “Chemically-Rich Structure and Dynamics in the Active Site of Tryptophan Synthase” $1,872,803 total cost. Co-PI ($225,000 direct cost)

2012-2016 US Department of Agriculture AES/RSAP award at UCR “Structural biology of citrus canker disease”. $45,000. Sole PI.

2012-2013 Hellman Scholar, Hellman Fellowship Foundation, USA. ($30,000)

2012 Recent Alumni Award, College of Natural Sci. Alumni Association, Michigan State Univ.

2012, 2013, 2014, 2015 Academic Senate Omnibus Travel Award, UCR.

Honorable Guest Professor (May 09, 2011), Central South University, Changsha, China.

R. Gaurth Hansen Award (2011) for outstanding alumni at early academic career, 50th anniversary of Department of Biochemistry and Molecular Biology, Michigan State University

Outstanding Graduate Student Award for Excellence in Research, Scholarship and Teaching (2000), Department of Biochemistry, Michigan State University, Michigan.

Graduate travel award (1999), College of Natural Sciences, Michigan State University, Michigan.

Professional Association Memberships
American Crystallography Association, Advanced American Association of Science, Protein Society, American Pharmaceutical Scientists Society.

Structural coordinates (12) in PDB hold prior publication


Published structural coordinates (12) in PDB.


**Conference and Seminar Presentations:**

06/13-17/2016 Poster presentation at the 2016 Cold Spring Harbor Asia Conference on DNA metabolism, Genomic Stability and Disease at Suzhou, China. Title: “Structural and functional study of a novel ATPase associated with Holiday junction resolvase Hjc”.

05/26-29/2016 Oral presentation at the 2016 International Conference on Nucleic Acid-Protein Chemical and Structural Biology for Novel Drug Discovery at Chengdu, China. Title: “Identification and characterization of a novel RuvB-like ATPase from *S. Islandicus*”

03/15/2015 Session Chair and Oral presentation at 22nd West Coast Protein Crystallography Workshop, Monterey, CA. Title: “Structural evidence supporting XPB helicase as a molecular wrench”.

02/08/2015 Poster presentation at Gordon Research Conference of Mammalian DNA Repair, Ventura, California. Title: “Structural evidence supporting XPB helicase as a molecular wrench”.

02/15/2014 Oral presentation at International Fusion conference of Dynamic Structures in DNA Damage Responses and Cancer, Cancun, Mexico. Title: “Structural study of XPB helicase: insight into molecular mechanism of DNA unwinding and impact of disease-causing mutations”

10/04/2013 Invited lecture at Molecular and Computational Biology program at University of Southern California (USC). Title: “Structural study of XPB helicase: insight into molecular mechanism of DNA unwinding and impact of disease-causing mutations”.

03/25/2013 Invited lecture at School of Life Sciences, Shangdong University, Jinan, China. Title: “How two helicases work together within the TFIIH complex, a perspective from structural studies of XPB and XPD helicases”.

03/25/2013 Invited lecture at State Key Laboratory of Microbial Technology, Shangdong University, Jinan, China. Title: “Structural biology of citrus canker: structural and functional studies on Xanthomonas proteins important for the disease”.

03/22/2013 Oral presentation at BIT’s 6th Annual World Protein and Peptide Conference 2013 at Suzhou, China. Title: “Crystal structures of Xanthomonas small heat shock protein provide a structural basis for active molecular chaperone oligomers”.

03/17/2013 Poster presentation at the West Coast Protein Crystallography Workshop XXI in Monterey, CA. March 16 - 21, 2013. Title: “The crystal structure of C-terminal half of the human XPB helicase at 1.8 Angstroms and the impact of the genetic disease-causing mutation XP11BE”.
11/30/2012 Invited lecture at Department of Botany and Plant Sciences and Center for Plant Cell Biology, University of California Riverside. Title: “Structural biology of citrus canker: structural and functional studies on Xanthomonas proteins important for the disease”.

05/10/2011 Invited lecture at Institute of Cancer Research, Central South University, Changsha, China. Title: “Structural biology of XPB and XPD in nucleotide excision repair and insights into clinical mutations in cancer and aging”.

05/09/2011 Distinguished lecture at Central South University, Changsha, China. Title: “Genome-wide structural and functional studies on Xanthomonas axonopodis pv citri (Xac)-citrus infections.”

04/26/2011 Oral presentation at the 2nd International Symposium on Enzymes & Biocatalysis-2011 in Dalian, China. Title: “Structural Basis of Disease Causing Mutation G47R at the ATP Binding Site of DNA Repair Helicase XPD”.

04/21/2011 Keynote speaker at 50th anniversary of Department of Biochemistry and Molecular Biology, Michigan State University, East Lansing, MI. Title: “Helicases are not built the same: crystal structures of archaeal XPB and XPD helicases reveal the “transmission” and “driving wheel” of TFIIH to open damaged DNA for DNA repair”.

04/07/2011 Invited lecture at Department of Chemistry and Biochemistry, California State University, Fullerton, California. Title: “Genome-wide structural and functional studies on Xanthomonas axonopodis pv citri (Xac)-citrus infections”.

11/17/2010 Invited Seminar for Environmental Toxicology Seminar Series 2010 Fall, UCR. Title: “Helicases are not built the same: crystal structures of archaeal XPB and XPD”.


3/02/2010 Invited Seminar in Biochemistry of BMB graduate program, UCR. Title: “Genome-wide studies on Xanthomonas axonopodis pv citri (Xac)-citrus infections by protein X-ray crystallography.”

11/02/2009 Invited Guest lecture at BCH095, UCR. Title: “Introduction to protein structure determination by X-ray crystallography.”

July 18-22, 2008. DNA Replication and Genome Integrity meeting. Salk Institute for Biological Studies, La Jolla, California. (Selected for Oral presentation). Title: “Insights into the Cancer and Aging Phenotypes from XPD Mutations: structural and function studies on archaean XPD helicase”.

May 8-10, 2008. The 7th Workshop of Structural Biology of DNA Repair. Berkeley, California. (poster) Title: "Crystal structures of XPD helicase from Sulfolobus acidocaldarius."


**Regular Class-room Teaching**

*BCH101*: Fundamental Biochemical Laboratory (3 units, Winter)

*BCH184*: Topics in Physical Biochemistry (4 units, 1/3 Winter)

*BCH210*: Biochemistry of Macromolecules (4 units, 1/4 Spring)

*BCH252*: BMB graduate seminar series (2 units, 1/3 Fall)

*NASC093*: Freshman Advising Seminars in Natural and Agricultural Sciences (2 units, fall)
NAME: Theodore Garland, Jr.

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

POSITION TITLE: Professor of Biology

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.)

<table>
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<tr>
<th>INSTITUTION AND LOCATION</th>
<th>DEGREE (if applicable)</th>
<th>Completion Date MM/YYYY</th>
<th>FIELD OF STUDY</th>
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<tr>
<td>University of Nevada, Las Vegas, Highest Honors</td>
<td>B.S.</td>
<td>05/1978</td>
<td>Zoology</td>
</tr>
<tr>
<td>University of Nevada, Las Vegas</td>
<td>M.S.</td>
<td>08/1980</td>
<td>Biology</td>
</tr>
<tr>
<td>University of California, Irvine</td>
<td>Ph.D.</td>
<td>08/1985</td>
<td>Biological Sciences</td>
</tr>
<tr>
<td>University of Washington</td>
<td>Postdoctoral</td>
<td>08/1987</td>
<td>Zoology</td>
</tr>
</tbody>
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A. Personal Statement

As a faculty member of the University of Wisconsin-Madison, I began study of the quantitative genetics of exercise behavior and physiology in outbred mice, and then implemented a long-term selective breeding experiment, beginning in 1993. Using our High Runner and Control mouse lines, my collaborators and I have successfully utilized all of the proposed methods, including administration of Western diet; manipulation of access to running wheels; characterization of voluntary exercise, spontaneous physical activity, and additional behavioral parameters; measurement of basal metabolic rate; and non-invasive assessment of body composition. In addition, we have extensive experience employing the mixed-model statistical techniques required for appropriate analysis of data derived from this selection experiment.

I have the experience, resources, and collaborators necessary to advise graduate students in the proposed graduate program. I have served as PI on multiple federally funded grants to support the selection experiment and to study the physiological, biochemical, anatomical, and experiential influences on differences in voluntary activity and spontaneous physical activity in High Runner vs. Control lines of mice. I have administered the budgets, made recruitment and hiring decisions, and supervised all personnel for these projects since the selection experiment was begun in 1993. I have developed leadership skills and demonstrated the ability to carry out a long-term selection experiment extending for 75 generations and over 23 years. I have also served as the sponsor for NIH NRSA awards at both the predoctoral and postdoctoral levels for additional studies on these lines of mice, as well as an existing R21.

Most of my research, and especially that involving the selection experiment, has involved numerous collaborators, including internationally. Hence, I understand the importance of clear and effective communication among participants, as well as developing a realistic budget, research plan, and timeline for graduate students. I know what it takes to advise graduate research projects on time and within budget.

B. Positions and Honors

**Positions**

1986-87 Lecturer, Department of Zoology, University of Washington

1987 Lecturer, Department of Ecology and Evolutionary Biology, Univ. of Calif., Irvine

1987-01 Assistant/Associate/Full Professor, Department of Zoology, University of Wisconsin-Madison

1991-92 Assistant/Associate Program Director, National Science Foundation, Population Biology and Physiological Ecology Program
2001-2016  Professor, Department of Biology, University of California, Riverside (also member of graduate programs in Evolution, Ecology, and Organismal Biology; Biomedical Sciences; Genetics, Genomics, and Bioinformatics; Neuroscience)

2001-2016  Distinguished Professor, Department of Biology, University of California, Riverside (also member of graduate programs in Evolution, Ecology, and Organismal Biology; Biomedical Sciences; Genetics, Genomics, and Bioinformatics; Neuroscience)

2006-  Associate Director, University of California Multicampus Research Program: Network for Experimental Research on Evolution (NERE) (http://ner.e.bio.uci.edu/)

2014-  Founding Director, Institute for the Development of Educational Applications (IDEA), University of California, Riverside (http://idea.ucr.edu/)

Other Experience and Professional Memberships

2007  NIH CADO Study Section, ad hoc phone reviewer
2008  NIH CADO Study Section, ad hoc phone reviewer
2010  NIH Peer Review Committee: Genetics of Longevity P01 consortium, ad hoc phone reviewer
2011  NIH Aging Consortium, ad hoc phone reviewer
2012  NIH Comparative Physiology of Aging, Special Emphasis Panel via phone
2013  NIH Comparative Physiology of Aging, Special Emphasis Panel Chair via phone
2015  NIH Comparative Physiology of Aging, Special Emphasis Panel Chair via phone

Honors

1974  Rotary Club Scholarship, U.N.L.V.
1974-78  Dean's Honor List, U.N.L.V.
1975  East African Natural History Safari Scholarship, U.N.L.V.
1976  Charter Member, Alpha Epsilon Delta, U.N.L.V.
1977  Elected Phi Kappa Phi, U.N.L.V.
1980  Regent's Fellowship, U.C., Irvine
1981  Honorable Mention, Edward A. Steinhaus Teaching Award, U.C., Irvine
1983-84  Fulbright Predoctoral Grant, Australia
1985  Regent's Dissertation Fellowship, U.C., Irvine
1985  Edward A. Steinhaus Teaching Award, U.C., Irvine
1985  Outstanding Graduate Student Scholar Award, U.C., Irvine
1986  Alternate Fellow (no funding), National Science Foundation Fellowship in Environmental Biology
1991-96  Presidential Young Investigator Award, National Science Foundation
1994  H. I. Romnes Faculty Fellowship, Wisconsin Alumni Research Foundation
1998  Vilas Associates Program, Wisconsin Alumni Research Foundation

Editorial Experience

1993-2000  Associate Editor, The American Naturalist
1997-2005  Editorial Board, Physiological and Biochemical Zoology
1999-  Editorial and Advisory Board, Zoology
2000-2010  Editorial Board, Journal of Morphology
2000-2002  Associate Editor, Evolution
2003-  Advisory Board, Ecological and Environmental Physiology book series, Oxford University Press
2005-2014  Associate Editor, Physiological and Biochemical Zoology
2009-  Editor of the Evolutionary Physiology section of Comprehensive Physiology
2014-  Editor in Chief, Physiological and Biochemical Zoology

Professional Memberships (current)

American Physiological Society
Society for Integrative and Comparative Biology
Society for the Study of Evolution

Teaching Experience at UCR

2002-present  Ecological and Evolutionary Physiology (BIOL 174, 3 credits)
2003-present  Evolution (BIOL 105, 4 credits)
C. Contribution to Science

1. Individual Variation in the Exercise Physiology of Natural Populations

Beginning with my Ph.D. dissertation research, I have explored the nature of individual variation in exercise physiology and activity metabolism in wild populations of vertebrates. I developed techniques for obtaining valid, reproducible, and physiologically based measured of locomotor endurance in lizards and snakes. I pioneered the use of residuals from regression equations as a way to remove statistically the confounding effects of such variables as body size, age, sex, and season. My studies were successful in demonstrating that individual differences in locomotor performance abilities are indeed repeatable on a day-to-day basis and represent variation in lower level traits expected to affect performance (e.g., heart size). They set the stage for subsequent quantitative genetic analyses by myself and many other workers.


2. Quantitative Genetics of Exercise Physiology in Squamates and Laboratory Rodents

Having demonstrated the physiological solidity of individual differences in squamate exercise performance abilities, the next logical question was the extent to which they were genetically based as opposed to the consequence of "natural training" that might occur as individuals moved about home ranges of different sizes, etc. By use of newborn snakes, we were able to demonstrate that a substantial fraction of the individual variation did, in fact, seem to be based in the additive effects of polygenes. I then applied a similar approach with laboratory mice, except that breeding designs could be much more sophisticated including cross-fostering, hence allowing much cleaner estimates of narrow-sense heritability and genetic correlations. These studies helped set the stage both for selection experiments with laboratory rodents and also subsequent genetic mapping efforts.


3. Selection Experiments as a Tool to Understand the Genetics and Evolution of Complex Behavior/Physiological Traits

Following from my quantitative genetic analyses of squamates and rodents, I turned to replicated artificial selection as an approach to elucidate the genetics, physiology, neurobiology, and evolution of activity levels.
Initially, this was motivated by interests in the evolution of exercise physiology, but in recent years we have turned towards studies with more direct biomedical relevance. This is a fairly easy transition because activity levels are intimately related to energy balance and health effects on numerous metabolic processes, organ systems, and disease processes. Most of our current research with the High Runner lines of mice involves (1) genetic mapping studies via SNP chips and whole-genome sequencing in the context of a fully defined pedigree for all eight lines across the entire experiment (76 generations) and (2) elucidation of the role of early-life effects in the high-activity phenotype of the HR mice.


4. Phylogenetic Analyses of Physiological Diversity

My training as a comparative physiologist led me to explore interspecific variation in exercise physiology, locomotor behavior, and related traits, primarily in small mammals and lizards. In the mid-1980s it became apparent from seminal studies in evolutionary biology that the standard way of analyzing variation among species was statistically inappropriate and often highly misleading. Therefore, as an Assistant Professor I initiated a research program to develop and test phylogenetically based statistical methods and associate computer software, which we have made freely available.


5. Development of the Field of Evolutionary Physiology

At the time I began my dissertation studies in 1980, the term "evolutionary physiology" did not exist. My work on individual variation, quantitative genetics, and phylogenetic analyses helped lay the groundwork for a burgeoning field that crystallized in the later 1980s and early 1990s. Review and perspective pieces brought the field into sharp relief. Presently, I serve as Editor-in-Chief of Physiological and Biochemical Zoology, one of the top journals in the field, and am enforcing a strict policy of ecological/evolutionary relevance for all manuscripts. In addition, I am the founding editor of the Evolutionary Physiology section of Comprehensive Physiology, in charge of commissioning review articles in this area.

Complete List of Published Work in My Bibliography:

Alternatively, all publication PDF files are available here:

As of 2 Feb. 2016, my publications have been cited a total of ~20,943 times, with an H-index of 72 (Web of Science) or 25,740 times, with an H-Index of 83 (Google Scholar: https://scholar.google.com/citations?user=iSSbrhwAAAAJ&hl=en).

D. Research Support

Current Research Support

R21HD075021   Saltzman, Garland, Chappell (PIs) 7/01/13-4/30/15
NIH/NICHD     plus 1-year no-cost extension
"Metabolic and Energetic Consequences of Fatherhood"
This research investigates the effects of fatherhood on energy balance, metabolism, behavior, and circulating concentrations of metabolically important hormones, and the influences of parity and stress on these effects, in the monogamous, biparental California mouse. Garland is responsible for organismal phenotyping, student training (graduate and undergraduate), data management, statistical analyses, and participation in manuscript preparation.
Role: PI

IOS-1256572   Saltzman (PI), Garland & Chappell (Co-PIs) 7/01/13-6/30/16
NSF            "Energetic and Immune Consequences of Fatherhood in a Biparental Mammal"
This research investigates the effects of fatherhood on exercise performance, energetics, and immune function, as well as possible modulatory effects of parity and chronic stress, in males of the biparental California mouse. Garland is responsible for organismal phenotyping, student training (graduate and undergraduate), data management, statistical analyses, and participation in manuscript preparation.
Role: Co-PI

R21HD084856   Garland, Saltzman (PIs) 7/10/15-6/30/17
NIH/NICHD
"Early-life Effects on Adult Physical Activity"
This research investigates the effects of early-life exposures to voluntary exercise and/or Western diet on adult physical activity, energy balance, metabolism, behavior, and circulating concentrations of metabolically important hormones, in selectively bred High Runner lines of mice and their non-selected control lines. Garland is responsible for overall organization and supervision, organismal phenotyping, student training (graduate and undergraduate), data management, statistical analyses, and manuscript preparation.
Role: PI

Recently Completed Research Support

IOS-1121273   Garland (PI) 8/1/11 - 8/31/15
NSF            (including 1-year, no-cost extension)
"Responses to Selective Breeding for High Voluntary Activity in House Mice"
This renewal used a holistic approach to elucidate how a complex behavior changes genetically in response to controlled and replicated cross-generational selective breeding. It tested physiological and neurobiological hypotheses concerning the limits to high levels of voluntary exercise, including effects of a high-fat diet. Garland was responsible for overall organization and supervision, organismal phenotyping, student training (graduate and undergraduate), data management, statistical analyses, and manuscript preparation.
Role: PI
University of California at Riverside Riverside, CA 2015-present
Assistant Professor, Department of Chemistry
CFM in Biochemistry, Environmental Toxicology, and Microbiology
Molecular characterization of protein homeostasis in health and disease

EDUCATION and TRAINING

The Scripps Research Institute La Jolla, CA 2010-2015
Protection of the Extracellular Space by Unfolded Protein Response Signaling

California Institute of Technology Pasadena, CA 2003-2009
Ph.D. in Chemistry from Prof. Jacqueline K. Barton
Exploring DNA-mediated Charge Transport with Fast Radical Traps

University of California Irvine, CA 2001-2002
B.S. Physics, minor in Mathematics

Swarthmore College Swarthmore, PA 1997-2001
B.A. Chemistry, minor in Economics, with High Honors

PUBLICATIONS

26) Hulleman*, J.D.; Genereux*, J.C.; Nguyen, A. “Mapping wild-type and R345W fibulin-3 intracellular interactomes”, in review. * indicates co-first author


**AWARDS AND HONORS**

The Scripps Research Institute

- *American Heart Association Postdoctoral Fellowship* 2014-2015
- *Ruth Kirchstein National Research Service Award (NHLBI F32)* 2010-2013

California Institute of Technology

- *Outstanding Graduate Teaching Assistant Service Award* 2008

**TEACHING AND MENTORING EXPERIENCE**

University of California, Riverside 2015-present

Instructor for Chem 221E, *Bioanalytical Chemistry* and Chem 1B, *Introduction to Chemistry*

Advisor to 3 Graduate students, 2 Postdoctoral scholars, 5 UCR Undergraduate students

The Scripps Research Institute

- Protein Folding in the Cell, Teaching Assistant 2013
- SURF Program Undergraduate Research Mentor 2012

California Institute of Technology

- SURF Program Undergraduate Research Mentor 2008
- Introduction to Chemistry, Recitation Teaching Assistant 2005-2008
- Biophysics of Macromolecules, Teaching Assistant 2004
- Frontiers in Chemistry, Teaching Assistant 2003-2004

University of California - Irvine

- LARC Tutor: Biochemistry and Physics courses 2002

Swarthmore College

- Laboratory Teaching Assistant: General and Organic Chemistry 2001

**PROFESSIONAL SERVICE**

- Ad hoc reviewer for the Medical Research Council
ROHLFS CURRICULUM VITAE
CHARLES RUSSELL HILLE

Distinguished Professor of Biochemistry
University of California, Riverside
Riverside, CA 92521

BIRTHDATE November 15, 1951
CITIZENSHIP U.S.
MARITAL STATUS Married, four children

EDUCATION
B.S. with Honors (Chemistry) Texas Tech University, Lubbock, TX, 1974
Ph.D. (Biochemistry) Rice University, Houston, TX, 1979

PROFESSIONAL EXPERIENCE
Graduate Study (with Dr. John S. Olson, Rice University, Houston, TX), 9/74 – 8/78
Post-doctoral Study (with Dr. Vincent Massey, University of Michigan, Ann Arbor, MI), 9/78 – 8/81
Lecturer, Department of Biological Chemistry, University of Michigan, Ann Arbor, MI, 9/81 – 10/82
Assistant Professor, Dept. of Biological Chemistry, University of Michigan, Ann Arbor, MI, 11/82 – 8/85
Assistant Professor, Dept. Mol. Cell. Biochemistry, The Ohio State University, Columbus, OH, 8/85 – 8/90
Associate Professor, Dept. Mol. Cell. Biochemistry, The Ohio State University, Columbus, OH, 9/90 – 6/95
Professor, Dept. Mol. Cell. Biochemistry, The Ohio State University, Columbus, OH, 7/95 – 9/07
Professor, Department of Chemistry, The Ohio State University, Columbus, OH, 10/95 – 9/07
Professor, Dept. of Biochemistry, University of California, Riverside, 9/07 – 6/14
Distinguished Professor of Biochemistry, University of California, Riverside, 7/14 - present

HONORS AND AWARDS
Phi Kappa Phi Honors Fraternity, Texas Tech University, Lubbock, TX, April 1974
Rice University Fellowship, Rice University, Houston, TX, Academic Year, 1974 - 1975
Michigan Society of Fellows, University of Michigan, Ann Arbor, MI, August 1978 - August 1981
Simson Faculty Research Award, College of Medicine and Public Health, The Ohio State University, 1997
Humboldt Senior Research Prize, Alexander von Humboldt Foundation, Germany, 2003-2004
Fellow of the American Association for the Advancement of Science, October, 2004
Wenner-Gren Fellow, University of Lund, Sweden, 2007
Chancellor’s Chair, University of California, 2007-2010
Humboldt Senior Research Prize, Alexander von Humboldt Foundation, Germany, 2011-2012
Distinguished Professor of Biochemistry, University of California, Riverside, 2014

PROFESSIONAL SOCIETIES
American Association for the Advancement of Science
American Society of Biochemistry and Molecular Biology
American Chemical Society

RECENT PROFESSIONAL SERVICE
Co-Founder, Molybdenum and Tungsten Enzymes Gordon Conference, Plymouth, NH (July 1999)
Chair, Molybdenum and Tungsten Enzymes Nomenclature Committee (advisory to the IUBMB/Enzyme Commission); July 2001 – August 2003
Scientific Advisory Committee, International Symposia on Flavins and Flavoproteins, April 2003 – present
Chair, Computational Biophysics Study Section, National Institutes of Health – November, 2005
Contributing Member, Faculty of 1000 – August 2006-present
Member, Biophysical and Biochemical Sciences Fellowship Study Section – March, 2010
Local Organizing Committee, 14th International Symposium on Flavins and Flavoproteins – July 24-29, 2011
Member, National Institutes of Health MSFE study section – February 2013
Member, Life Sciences Review Panel for the National Research Council – March 2013 - present
RECENT UNIVERSITY SERVICE/ADMINISTRATION
Search Committee for Chair of the Department of Neuroscience (OSU), January 2001 - June 2002
Promotion and Tenure Committee, College of Medicine and Public Health (OSU), July 2002 – October 2003
Chair, Structural Biology I Search Committee, Dept. Mol. Cell. Biochemistry (OSU), 2001/02 Academic Year
Chair, Structural Biology II Search Committee, Dept. Mol. Cell. Biochemistry (OSU), 2002/03 Academic Year
Interim Chair, Department of Molecular and Cellular Biochemistry (OSU), October 1, 2004 – January, 2007
Research Committee, College of Medicine and Public Health (OSU), October 2004 – September, 2005
Steering Committee, Medical Scientist Program, College of Medicine (OSU), Oct 2004 – January, 2007
Organizer, “Mathematical Modeling of Enzyme Dynamics and Reactivity”, Mathematical Biosciences Institute, (OSU), May, 2005
Chair, Department of Biochemistry, University of California, Riverside, August, 2007 – November, 2010
Member, Search Committee for CNAS Dean, UC Riverside, 2008
Member, Search Committee for Dean of the Medical School, UC Riverside, 2009
Chair, Structural Biology Search Committee, Department of Biochemistry – 2010/2011 Academic Year
Graduate Advisor, Biochemistry and Molecular Biology graduate program – program – July 2012 - present
UCR Senate Committee on Academic Personnel – July 2013 - present

RESEARCH INTERESTS
Structure/function relationships in redox-active enzymes; Inorganic biochemistry, particularly involving molybdenum; Spectroscopy of redox-active proteins; Biological electron transfer

15-YEAR GRANT HISTORY
National Science Foundation MCB 9420185; “Physical Studies of Xanthine Oxidase and Trimethylamine Dehydrogenase” (R. Hille, PI) $305,000 TDC, 1/95 - 12/97
National Science Foundation INT 9513747; “Pulse radiolysis studies of xanthine oxidase and trimethylamine dehydrogenase” (R. Hille, PI) $18,000 TDC, 12/1/95 – 11/30/99
National Institutes of Health R01 GM52322; “Mechanistic Studies of Oxomolybdenum enzymes” (R. Hille, PI) $565,074 TDC, 3/1/96 – 2/29/00
Monbyuso (Japanese Ministry of Science) “Structure/function studies of xanthine oxidoreductase” (T. Nishino, PI; R. Hille and E.F. Pai, additional PI's) $18,000 TDC, 4/01 – 3/04
National Institutes of Health R01 GM59953 "Studies of Molybdenum-containing Enzymes" (R. Hille, PI) 9/1/99-12/31/04, $756,500 TDC
National Institutes of Health R01 GM58481 "Studies of Trimethylamine Dehydrogenase" (R. Hille, PI) $453,350 TDC, 1 2/1/99-12/31/04
National Institutes of Health R01 GM075036 “Structure/activity studies of two molybdenum enzymes” (R. Hille, PI) $650,000 TDC, 7/12/05 – 6/30/11
National Institutes of Health R01 ES012658 “Studies of environmentally important molybdenum enzymes” (R. Hille, PI) $1,092,500 TDC, 9/1/05 – 8/31/12
Department of Energy DE FG02-13ER16411 “Structure, Function and Reactivity of CO Dehydrogenase from Oligotropha carboxidovorans” (R. Hille, PI) $480,000 TDC, 8/1/13 – 7/31/16

ACTIVE GRANT SUPPORT
Department of Energy DE FG02-13ER16411 “Structure, Function and Reactivity of Energy- Relevant Molybdenum Enzymes” (R. Hille, PI) $725,000 TDC, 8/1/16 – 7/31/19
PEER-REVIEWED JOURNAL ARTICLES (CORRESPONDING AUTHOR IN BOLD - )


75. Ellis, P., Conrads, T., Hille, R., & Kuhn, P. (2001) Crystal structure of the 100 kDa arsenite oxidase from *Alcaligenes faecalis* in two crystal forms at 1.64 and 2.03 Å. *Structure* 9, 125-132.


Manuscripts submitted or in preparation


**REVIEW ARTICLES**


PEER-REVIEWED BOOK CHAPTERS AND SYMPOSIUM PROCEEDINGS


Editorships


Invited Talks at National and International Meetings (since 2000)

Iron-Sulfur Proteins Meeting, King’s College London, UK – May, 2000
Inorganic Biochemistry Summer Workshop, University of Georgia, Athens, GA – August, 2000
International Symposium on Bioinorganic Chemistry, Mumbai, India – November, 2000
Robert C. Bray Memorial Symposium, University of Sussex, UK – September, 2002
Japanese Biochemical Society Meeting, Kyoto, Japan – October, 2002
Midwest Metals Meeting, Washington University, St. Louis – May, 2003
7th European Symposium on Bioinorganic Chemistry, Garmisch-Partenkirchen, Germany – August, 2004
Curti Symposium on Flavins and Flavoproteins, University of Milan, Italy – October, 2006
FLAK Symposium, Brosarp, Sweden – June, 2007
2nd Intl Conference on Vitamins, Coenzymes and Biofactors, University of Georgia – October, 2008
Molybdenum and Tungsten Enzyme Gordon Conference, Il Ciocco, Italy – July, 2009
Symposium on Advances in Biological Inorganic Chemistry, TIFR, Mumbai, India – November, 2009
Second International Symposium on Enzymes and Biocatalysis, Dalian, China – April, 2011 (Keynote Lecture)
Second International Symposium on Enzymes and Biocatalysis, Dalian, China – April, 2011 (Session Lecture)
17th International Symposium on Flavins and Flavoproteins, Berkeley, CA – July, 2011
Molybdenum and Tungsten Enzyme Conference, Edmonton, Alberta – August, 2011
DFG “Prosthetic Groups: Transport and Insertion” Meeting, Burg Warberg, Germany – September, 2011
US Department of Energy CO₂ Reduction Workshop, Annapolis, MD – October, 2011
Metal Hydrides in Biology Workshop, University of Oxford, UK – March, 2012
C1 Metabolism Gordon Conference, Bates College, NH – August, 2012
16th International Conference on Bioinorganic Chemistry, Grenoble, France – July, 2013

DoE Physical Biosciences Meeting, Annapolis, MD – October, 2014
Molybdenum and Tungsten Enzymes Meeting, Balatonfüred, Hungary – September, 2015
38th Solar Photochemistry Meeting, Gaithersburg, MD – January, 2016
6th Symposium on Bioinorganic Chemistry, Kolkata, India – January, 2017
11th Molybdenum and Tungsten Enzymes Meeting, Santa Fe, NM – June, 2017
19th International Symposium on Flavins and Flavoproteins, Groningen, Netherlands – July, 2017

Invited Seminars (since 2000)
Department of Biochemistry, Pennsylvania State University – January, 2000
Department of Biochemistry, The John Innis Center, Norwich, UK – May, 2000
Department of Chemistry, The University of Edinburgh, UK – May, 2000
Departments of Biochemistry and Chemistry, The University of Leicester, UK – May, 2000
Central Research Division, Pfizer Inc., Groton, CT – July, 2000
Department of Chemistry, University of New Mexico – October, 2000
Department of Biochemistry, Wright State University – January, 2001
Department of Chemistry and Biochemistry, Utah State University – January, 2001
Department of Chemistry, Duquesne University – March, 2001
Chemical Biology and Biophysics Programs, The University of Michigan, Ann Arbor – October, 2001
Biochemistry and Molecular Biology Program, University of Texas Health Sci Ctr, Houston – October, 2001
Department of Microbiology, University of Brisbane – January, 2002
Department of Chemistry, University of Wisconsin (Milwaukee) – February, 2002
Department of Chemistry, University of Osaka (Japan) – October, 2002
Department of Microbiology and Immunology, University of Illinois, Chicago – November, 2002
Department of Biochemistry and Molecular Biophysics, University of Arizona – November, 2002
Department of Chemistry, University of Auckland, New Zealand – February, 2003
Department of Biochemistry, University of Texas Health Science Center, San Antonio – April, 2003
Department of Plant Biology, Technical University of Braunschweig, Germany – September, 2003
(Humboldt Lectures on Enzymology and Spectroscopy of Metalloenzymes)
Department of Microbiology, Technical University of Braunschweig, Germany – September, 2003
Department of Biophysics, Medical College of Wisconsin – February, 2004
Department of Biochemistry, Medical College of Wisconsin – May, 2004
Department of Microbiology, University of Halle, Germany – June, 2004
Department of Microbiology, University of Bayreuth, Germany – June, 2004
Departments of Biochemistry and Microbiology, Michigan State University – March, 2005
The subject of these presentations was one of the following: (1) the mechanism of xanthine oxidase and other molybdenum enzymes; (2) the mechanism of trimethylamine dehydrogenase; (3) electron transfer in biological systems; (4) structure and function of arsenite oxidase; or (5) the reaction mechanism of CO dehydrogenase.
**Research Program**

My research program focuses the reaction mechanisms of oxidoreductase enzymes - particularly those possessing molybdenum or flavin in their active sites - and biological electron transfer. The molybdenum-containing enzymes catalyze the incorporation of oxygen into a variety of organic and inorganic compounds, and constitute an important enzyme class within the oxidoreductases. These enzymes have been only poorly understood in comparison to other biological systems that contain heme, flavin, non-heme iron or copper. Working with representative members of each of the three major families of molybdenum enzymes, we have successfully identified the fundamental aspects of the catalytic sequences of these enzymes, and in each case established the overall chemical course of the reaction. Particularly in the case of the molybdenum hydroxylase family (as represented by xanthine oxidase), work in our laboratory has elucidated the overall reaction mechanism, characterizing each of the principal intermediates in the course of the reaction both spectroscopically and crystallographically. This work has demonstrated that molybdenum-based hydroxylation of carbon centers is carried out without the generation of a highly reactive oxygenated intermediate (e.g., the perfferryl oxide and 4a-peroxide "oxygen guns" of heme and flavin containing enzymes, respectively). These studies have provided an increasingly clear picture of the chemical sequence of events that lead to oxygen atom transfer in the absence of a high-energy intermediate, and our reaction mechanism is generally accepted in the literature. Other enzymes under active investigation in the laboratory include: sulfite oxidase and nitrate reductase from plants (such as *Arabidopsis thaliana*), the latter of which catalyses the first and rate-limiting step in nitrogen assimilation in higher plants; carbon monoxide dehydrogenase and DMSO reductase from *Rhodobacter capsulatus*, which play major roles in environmental CO remediation and the global sulfur cycle, respectively; and newly discovered molybdenum-containing enzymes that play as yet undefined physiological roles in humans and bacteria (mARC, YeY, YcbX, YiiM).

Enzymes possessing multiple redox-active centers in a single polypeptide are useful systems in which to examine the factors governing rates of biological electron transfer without the complication of protein-protein interactions. We are utilizing pH-jump stopped-flow, flash photolysis and pulse radiolysis methodologies to examine the rates of electron transfer within several such enzymes, including xanthine oxidase (possessing a molybdenum center, two [2Fe-2S] clusters and FAD), trimethylamine dehydrogenase (with FMN and a [4Fe-4S] cluster) and succinate:quinone oxidoreductase (with FAD, three different iron-sulfur centers, a b-type cytochrome and a tightly bound equivalent of ubiquinone). Our work with xanthine oxidase has shown, for example, that protonation/deprotonation of the enzyme flavin occurs concomitantly with electron transfer. By contrast, in trimethylamine dehydrogenase, protonation and electron transfer occur as discrete steps, rather than concomitantly. We have recently extended this work to studies of succinate:quinone oxidoreductase, demonstrating, for example, that electron equilibration involving the enzyme’s heme is extremely rapid, despite the rather low reduction potential of the center. In each of these systems, electron transfer is generally extremely rapid and is typically not rate-limiting for turnover.

**Laboratory Facilities**

The above research program utilizes a wide range of spectroscopic techniques, including: x-ray absorption, electron paramagnetic resonance and resonance Raman. A variety of kinetic methods are also employed, including stopped-flow, freeze-quench, flash photolysis and pulse radiolysis. The principal instrumentation in the laboratory, most of which has been funded by two Shared Instrumentation Grants from NIH and one from NSF, is described below.

**EPR facility.** This facility consists of a computer-controlled Bruker ER300 EPR spectrometer capable of operating at 3, 9 and 34 GHz microwave frequency. The instrument is equipped with NMR gaussmeter and microwave frequency counter for the accurate determination of g-values. A variety of microwave cavities are available (including cylindrical and double-rectangular), as is cryogenic equipment for operation at both liquid nitrogen and liquid helium temperatures.

**Resonance Raman facility.** This instrument has been designed for optimal efficiency in the vis/NIR region. Kr+ and Ar+ lasers (Coherent, Inc.) provide a number of specific excitation lines and may also be used to pump either a titanium/sapphire or dye laser to provide excitation throughout the visible/NIR. The detector is a charge-coupled device whose active element is a 1024 x 1024 back-thinned element. Low-temperature capabilities are provided by an APD Cryogenics closed cycle liquid helium refrigerator. The
instrument is located in a specially designed room of the laboratory that is dedicated to spectroscopic instrumentation, including an Aviv Associates CD spectrophotopolarimeter (280 - 2,000 nm spectral range) and a recently upgraded Mattson Sirius 100+ FT-IR interferometer.

**Laboratory:** two large chromatography refrigerators, Millipore water purification system, and centrifuges (Beckman L7-65 and J2-21 ultra- and high-speed centrifuges, Tomy MTX-150 tabletop refrigerated centrifuge). New Brunswick BioFlow 415 fermentor; two Åkta FPLC protein purification systems; Millipore cell harvester; anaerobic trains, anaerobic glassware, *etc.* for manipulation of protein samples; two Applied Photophysics computer-controlled absorbance/fluorescence stopped-flow apparatuses; three Hewlett-Packard 8452A diode-array spectrophotometers; renovated Cary 14 spectrophotometer (including computer) with a 280-3000 nm scan range; Aviv Associates spectrophotometer (280 - 2,000 nm spectral range); Beckman HPLC apparatus; EG&G 363 potentiostat and associated electrodes; Coy glove box.

**Computer:** SGI Octane2/V10 molecular graphics workstation; two eight-processor Linux boxes; several desktop computers; software for the simulation of rapid kinetic transients and EPR spectra, analysis of x-ray absorption spectroscopic data, X-ray crystallography (COOT, ) and computational chemistry (MOPAC, GAUSSIAN ’08).

**Existing Scientific Collaborations**

**Nationally**

Gary Cecchini (Department of Biochemistry and Biophysics, University of California, San Francisco) – Kinetic studies of succinate dehydrogenase

John Enemark (Department of Chemistry, University of Arizona) – ESEEM and NMR studies of molybdenum enzymes

Brian Hoffman (Northwestern University) – ENDOR studies of paramagnetic intermediates of metalloenzymes

Richard Holm (Department of Chemistry, Harvard University) – Isotopic labeling studies of molybdenum-containing enzymes

Martin Kirk (Department of Chemistry, University of New Mexico) – Spectroscopic characterization and modeling of intermediates for molybdenum enzymes

**Internationally**

Robert Anderson (Department of Chemistry, University of Auckland, New Zealand) – Pulse radiolysis studies of complex redox-active enzymes

Fraser Armstrong (Department of Chemistry, University of Oxford, UK) – electrochemical studies of complex redox-active enzymes

Holger Dobek (Department of Biochemistry Humboldt University, Berlin) – mechanistic studies of 2-oxoquinoline oxygenase and nicotinate dehydrogenase

Graham George (University of Saskatchewan, Canada) – X-ray absorption studies of molybdenum-containing enzymes

Silke Leimkühler (Department of Biochemistry, University of Potsdam, Germany) – Spectroscopic and kinetic studies of xanthine dehydrogenase from *Rhodobacter capsulatus*; molybdenum cofactor insertion

Ralf Mendel (Institute of Plant Biology, Technical University of Braunschweig, Germany) – Mechanistic studies of molybdenum enzymes from plants

Takeshi Nishino (Department of Biochemistry and Molecular Biology, Nippon Medical School, Tokyo, Japan) and Emil Pai (Department of Biochemistry, University of Toronto, Toronto, Canada) – Structure/function studies of xanthine oxidase and related enzymes

Günter Schwarz (Department of Biochemistry, University of Cologne) – Structure/function studies of nitrate reductase from plants

Matthias Ullmann (Department of Chemistry, University of Bayreuth) – computational studies of molybdenum-containing enzymes
Richard J. Hooley, Ph.D.
University of California, Riverside,
444 Chemical Sciences, 501 Big Springs Road, Riverside CA 92521.
richard.hooley@ucr.edu • (951)-827-4924

Professional Preparation

Appointments
Associate Professor, University of California, Riverside 2014-current
Assistant Professor, University of California, Riverside 2008-2014
Skaggs Postdoctoral Fellow, The Scripps Research Institute, La Jolla 2004-2008
Graduate Teaching/Research Assistant, Princeton University, NJ 1999-2004

Awards and Honors

Peer-Reviewed Publications (Bold = Undergraduate Coauthor)

Independent Career


Postdoctoral Work


**Graduate Work**


**Undergraduate Work**

Research Funding, Last 48 Months

Hellman Faculty Foundation Grant, $30,000 07/01/2011 - 06/30/2013
"Molecular Motion and Molecular Recognition at the Nanoscale"

NSF CAREER Award, $600,000 02/01/2012 - 01/31/2017
"Functional Metal-Ligand Assemblies: Self-Sorting, Supramolecular Catalysis and Molecular Dynamics"

NSF TUES (Co-PI, 33%), $199,350 07/01/2012 - 06/30/2015
"Developing Pedagogies of Engagement in Foundation Chemistry Courses: Enhancing Minority Retention in STEM Majors"

UC Riverside IGF Program (PI, 80%) 08/01/2013 - 06/30/2014
"Synthetic Receptors as Selective Hosts and Transfection Agents in Living Cells"

UC Cancer Research Coordinating Committee, $50,000 07/01/2014 - 06/30/2015
"Synthetic Receptors As New Methods Of Drug Delivery For Cancer Therapy"

NSF IUES (Co-PI, 40%), $249,630 07/15/2015 - 06/30/2017
"A NIMBLE Approach to Active Learning in Large Enrollment Introductory Chemistry Courses (NIMBLE = New Implementations of Massive Blended Learning)"

Invited Talks

Syracuse University, Apr 2010
California State University, Long Beach, Sep 2010
American Chemical Society Western Regional Meeting, Mar 2011
Princeton University, Nov 2011
University of Southern California, Apr 2012
University of Texas - El Paso, September 2012
University of California, San Diego, October 2012
University of California, Santa Barbara, November 2012
University of California, Irvine, November 2012
Oregon State University, December 2012
University of Oregon, December 2012
Duke University, February 2013
University of North Carolina, February 2013
University of South Carolina, February 2013
Princeton University, February 2013
Georgetown University, February 2013
University of Maryland, February 2013
University of California, Davis, February 2013
University of Massachusetts, Amherst, March 2013
Dartmouth University, March 2013
University of San Diego, March 2013
University of Texas, Austin, April 2013
Denver University, May 2013 (Invited as the Marsico Lecturer)
University of California, Los Angeles, May 2013
University of Tennessee, Jan 2014
San Diego State University, Feb 2014
American Chemical Society National Meeting, Aug 2014 (Self-Assembled Coordination Architectures Symposium)
Synergistic Activities


Advising mentor: Maximizing Access To Research Careers (MARC U*), California Alliance for Minority Participation (CAMP), UC Leadership Excellence through Advanced Degrees (UC-LEADS), Mentoring Summer Research Internship Program (MSRIP) programs, UC Riverside.

Current Collaborators: Prof. Christopher Bardeen, University of California, Riverside; Prof. Quan Cheng, University of California, Riverside; Prof. Ryan R. Julian, University of California, Riverside; Prof. Leonard Mueller, University of California, Riverside; Prof. Natasha Raikhel, University of California, Riverside; Prof. Yinsheng Wang, University of California, Riverside; Prof. Francisco Zaera, University of California, Riverside; Prof. Wenwan Zhong, University of California, Riverside. Prof. Yadong Yin, University of California, Riverside.

Previous Collaborators (Last 48 months): Prof. Roger Acey, California State University - Long Beach; Prof. Pingyun Feng, University of California, Riverside; Prof. Cynthia Larive, University of California, Riverside; Prof. Michael Schramm, California State University - Long Beach; Prof. Travis Williams, University of Southern California; Prof. Emma Wilson, University of California, Riverside.

Graduate and Postdoctoral advisors

M.Sci. Mentor: Dr. Stuart Warren, Dept. of Chemistry, Cambridge University.
Ph.D. Mentor: Prof. Martin F. Semmelhack, Dept. of Chemistry, Princeton University.
Postdoctoral Mentor: Prof. Julius Rebek, Jr., Dept. of Chemistry, The Scripps Research Institute.

Graduate Students and Postdoctoral Scholars Advised (B: Black, F: Female, H: Hispanic)


Previous Graduate Students (attained Ph.D.): Katherine Djernes F, Ana Gamboa F,H, Amber Johnson F, Michael Young, Melissa Padilla Moehlig F,H, Yoo-Jin Ghang F.

Previous Postdoctoral Scholars: Puhong Liao.
Current Undergraduate Researchers: Phoebe Nye\textsuperscript{F}, Samantha Byers\textsuperscript{F}, Manolia Ghouli\textsuperscript{F,B}.

Previous Undergraduate Researchers: Kelsi McCoy\textsuperscript{F}, Hannah Hughes\textsuperscript{F}, Brian Langloss, Orly Moshe\textsuperscript{F}, Cindy Tawfik\textsuperscript{B,F} (MARC U* Scholar), Donald Richards\textsuperscript{B} (MARC U* Scholar), Magi Mettry\textsuperscript{B,F}, Kristianna Wi\textsuperscript{F}, Adam Gill, Erica Liew\textsuperscript{F}, Noora Siddiqui\textsuperscript{F,B}, Mi La\textsuperscript{F}, Jessica Arguelles (MARC U* Scholar),\textsuperscript{F,H} Linhui Li\textsuperscript{F} (MARC U* Scholar), Wendy Carabajal\textsuperscript{F,H}, Hannah McGarraugh\textsuperscript{F}. 
G. Darrel Jenerette  
Department of Botany and Plant Sciences  
University of California Riverside  
Riverside, CA 92521-0124  
Tel: 951/214-0564 • Fax: 951/827-4437 • Email: darrel.jenerette@ucr.edu  

Research Interests  
Landscape ecology • Ecosystem ecology • Ecohydrology • Global change • Sustainability  

Academic Appointments  
Associate Professor 2013 – Present  
Assistant Professor 2008 – 2013  
Department of Botany and Plant Sciences, University of California Riverside  

Education and Training  
Postdoctoral Researcher. Carbon Management and Sequestration Center, School of Natural Resources, The Ohio State University, Columbus, OH. 2004 – 2005  
Ph.D. Department of Plant Biology, Arizona State University, Tempe, AZ. 2004  
B.S. Virginia Polytechnic Institute and State University, Blacksburg, VA. 1995  

Awards  
Visiting Fellowship for Young International Scientists, Chinese Academy of Sciences. 2011-2012  
Early Career Fellowship, Consortium of Universities for the Advancement of Hydrologic Science (CUAHSI) 2007  
Biological Informatics Postdoctoral Fellowship, National Science Foundation. 2005-2007  
Graduate Fellowship, Urban Ecology Integrative Graduate Education and Research Traineeship (IGERT), National Science Foundation. 2001-2004  
Tony Gonzales Excellence in GIS Scholarship. Arizona Geographic Information Council. 2004  

Publications (Lab members in bold)  
Total Refereed Publications 88; Technical 69; Review 5; Other 14  
Technical Journal Articles  

2016  
(67) Tayyebi A and GD Jenerette. 2016. Increases in the climate change adaption effectiveness and availability of vegetation across a coastal to desert climate gradient in metropolitan Los Angeles, CA, USA. Science of the Total Environment 548-549:60-71


(64) **Jenerette GD**, SL Harlan, **A Buyantuev**, WL Stefanov, J Declet-Barreto, BL Ruddell, S Myint, S Kaplan, and X Li. 2016. Micro scale urban surface temperatures are related to land cover features and heat related health impacts in Phoenix, AZ USA. *Landscape Ecology* 31:745-760

2015


(62) **Chatterjee A** and **GD Jenerette**. 2015. Variation in soil organic matter accumulation and metabolic activity along an elevation gradient in the Santa Rosa Mountains of Southern California, USA. *Journal of Arid Land* 7:814-819

(61) Xie JB, GQ Xu, **GD Jenerette**, YF Bai, ZY Wang, and Y Li. 2015. Apparent plasticity in functional traits determining competitive ability and spatial distribution: a case from the desert. *Scientific Reports* 5:12174


(53) Avolio ML, DE Pataki, S Pincetl, T Gillespie, **GD Jenerette**, and HR McCarthy. 2015. Understanding preferences for tree attributes: the relative effects of socio-economic and
local environmental factors. *Urban Ecosystems* 18:73-86

(52) **Clarke LW** and **GD Jenerette**. 2015. Biodiversity and direct ecosystem service regulation in the community gardens of Los Angeles, CA. *Landscape Ecology* 30:367-653


(49) **Clarke LW**, **GD Jenerette**, and DJ Bain. 2015. Urban legacies and soil management affect the concentration and speciation of soil metals in Los Angeles community garden soils. *Environmental Pollution* 197:1-12

2014


(47) Barron-Gafford GA, JM Cable, LP Bentley, RL Scott, TE Huxman, **GD Jenerette**, and K Ogle. 2014. Quantifying the time scales over which exogenous and endogenous conditions affect soil respiration. *New Phytologist* 202:442-454


2013


(2) **Jenerette GD** and J Wu. 2001. Analysis and simulation of land-use change in the central Arizona - Phoenix region, USA. *Landscape Ecology* 16:611-626


**Refereed Review Articles**


**Refereed Conference Proceedings**

(4) Martin CA, **GD Jenerette**, SL Harlan. 2012. Air and near surface temperature regimes in neighborhood parks of Phoenix, Arizona, USA during extreme summer heat. 4 pgs. 8th International Conference on Urban Climates


**Other Refereed Scholarly Publications**

Ecosystem Services and Resource Management


(4) Scott RL, **GD Jenerette**, TE Huxman. 2010. Semiarid Ecohydrological Array – SECA. Fluxletter 2:10-12

(3) **Jenerette GD** and J Wu. 2010. Quantitative measures and landscape ecology. In L. Kapustka, W. Landis, and A. Johnson (eds.) *Environmental Risk Assessment and Management from a Landscape Perspective* John Wiley and Sons. 75-96


**Research Funding** ($19.8M total; $3.7M to Jenerette)

<table>
<thead>
<tr>
<th>Date</th>
<th>Funding Source</th>
<th>Project Description</th>
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<tbody>
<tr>
<td>06/2016-</td>
<td><strong>United States Department of Agriculture</strong></td>
<td>Resampling the Los Angeles Urban Forest, $27,000 PI</td>
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<td>12/2017</td>
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<tr>
<td>04/2016-</td>
<td><strong>Earthwatch Institute</strong></td>
<td>Towards designing a more sustainable urban forest. $85,000 PI</td>
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<td>04/2016-</td>
<td><strong>National Institute of Food and Agriculture</strong></td>
<td>USDA Cultivating Diversity in a 2+2 Collaborative Project. $90,490 coPI (with M McGiffen PI, and H Liu)</td>
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<td>03/2019</td>
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<tr>
<td>05/2016-</td>
<td><strong>National Institute of Food and Agriculture</strong></td>
<td>Reducing gaseous nitrogen losses from high temperature agricultural systems. $499,251 PI (with J Wang, POikawa)</td>
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<td>04/2019</td>
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<tr>
<td>09/2015-</td>
<td><strong>Earthwatch Institute</strong></td>
<td>Linking urban tree leaf traits to potential cooling benefits across a large US metropolitan area. $94,071 PI</td>
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<td>08/2018</td>
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<tr>
<td>07/2015-</td>
<td><strong>UC Agricultural and Natural Resources Division</strong></td>
<td>Ensuring the success of ANR Flux: Evaluation of long-term network configuration and initial science applications. $61,360 PI</td>
</tr>
<tr>
<td>07/2016</td>
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</tr>
<tr>
<td>08/2015-</td>
<td><strong>National Science Foundation</strong></td>
<td>Urban Water Innovation Network (U-WIN): Transitioning Toward Sustainable Urban Water Systems. $12,000,000 ($319,210 to UCR) Sub-Award PI, Project Senior Personnel (with M Arabi Project PI, A Berkowitz, E Bou-Zeid, GE Pivo, R Haggerty, C Welty, J Bolson, MSukop)</td>
</tr>
<tr>
<td>08/2020</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
01/2015-12/2018 **National Aeronautical and Space Administration**, Enhanced data-driven decision support for highly invasive vectors. $1,189,773 ($161,630 to UCR) Sub-Award PI (with C Barker Project PI, WK Reisen, T Scott, F Melton)

07/2014-12/2015 **UCMexus**, Effect of land use, soil type and agricultural practices on preserving organic soil carbon stocks. $14,900 coPI (with M Allen PI, E Allen, H Estrada Medina, J Jiminez-Osornio)

06/2014-05/2015 **National Science Foundation**, Dissertation Research: Connecting dryland soil trace gas emissions of NOx, N2O and CO2 to microbial community dynamics along a nitrogen deposition gradient. $19,745 PI in support of J Eberwein (DDIG)

08/2013-07/2015 **U.S. Agency for International Development**, Evaluating climate change impacts on the arid lands and water resources of Jordan, $87,000 coPI (with Y Jaraweh PI)

11/2012-10/2015 **National Aeronautic and Space Administration**, Assessing relationships between urban land cover, surface temperature, and transpiration along a coastal to desert climate gradient, $501,326 PI

08/2012-09/2013 **California Institute for Energy and the Environment**, Carbon balance in California deserts: Impacts of widespread solar power generation, $149,890 coPI (with M Allen PI, L Santiago)

06/2012-05/2014 **National Science Foundation**, Dissertation Research: The effect of human management and soil properties on heavy metal content of Los Angeles Community Garden soils, $14,980 PI in support of L Clarke (DDIG)

06/2012-08/2012 **California Avocado Commission**, Initial scoping of ecosystem services provided by avocado orchards in southern California, $20,000 PI

10/2011-11/2013 **United States National Park Service**, Atmospheric nitrogen deposition assessment in the Santa Monica Mountains NRA and the effects on weed invasion, $100,000 coPI (with E Allen PI, J Sickman, M Fenn)

07/2011-07/2014 **United States Forest Service**, Assessing the effects of local water district policies on urban forests and their implications across socio-economic groups, $64,000 coPI (with K Baerenklau PI, K Schwabe)

10/2011-12/2016 **United States Forest Service**, Base-level vegetation mapping for the Angeles National Forest, $164,740 PI

07/2011-06/2015 **National Institute of Food and Agriculture**, Life cycle assessment of sequestration and exchange of water, carbon and nitrogen in the dedicated bioenergy feedstock, energy cane, $967,769 coPI (with D Grantz PI)

07/2011-06/2014 **National Science Foundation**, Collaborative research: Assessing decadal climate impacts on urban populations in the Southwestern USA, $897,000 ($147,000 to UCR) PI on Collaborative Proposal (with B Ruddell Project PI, M Maoustauouri, E Vivoni)

02/2011-02/2014 **United States Golf Association**, Water-Use efficiency and carbon sequestration influenced by turfgrass species and management practices, $55,553 PI (with J Baird)

07/2009-06/2013 **National Science Foundation**, Collaborative research: Toward a biogeography of urban forests, $791,498 ($249,670 to UCR) PI on Collaborative Proposal (with D Pataki Project PI, S Pincetl, T Gillespie)

07/2009-06/2010 **National Science Foundation**, Research starter grant: An urban environmental observatory, $50,000 PI
01/2009 - **Coachella Valley Association of Governments**, JS-CVCC CVMSHCP Monitoring Program 2009 Administrator, $116,000 coPI (with M Allen Project PI, C Barrows, E Allen, R Redak, J Rotenberry, W Walton)

01/2009 - **Kearney Foundation**, Soil metabolic variability across a 3000 meter topographic gradient: Understanding the long term consequences of short duration dynamics, $89,900 PI (with M Allen)

10/2010 - **National Park Service**, Alien invasion: Effects of atmospheric nitrogen deposition on sagebrush steppe vegetation dynamics at Upper Columbia Basin network parks, $100,000 coPI (with E Allen Project PI, J Sickman)

09/2008 - **National Science Foundation**, Collaborative Research: Urban vulnerability to climate change: A systems dynamics analysis, $1,500,000 ($135,000 to UCR) PI on Collaborative Proposal (with S Harlan Project PI, C Martin, T Lant, S. Grossman-Clark, W. Stefanov, M Elser)

06/2008 - **United States Department of Agriculture**, LAMillion Trees: Distribution and physiological characteristics, $15,500 PI

**Synergistic Activities**

*Congressional Briefings*


*Invited Outreach*


*Funding Agency Panel Member*
National Science Foundation Environmental Protection Agency

*Funding Agency Ad hoc Reviewer*
National Science Foundation Department of Energy
Kearney Foundation of Soil Science

*Editorial Board Member*
Landscape Ecology 2008 - Present
Frontiers in Ecology and Evolution 2015 - Present

*Journal Referee*
Agricultural and Forest Meteorology • Applied Geography • Biogeosciences • Bioscience • Cities • Ecological Applications • Ecological Complexity • Ecological Economics • Ecological Modelling • Ecology • Ecology Letters • Ecosystems • Environmental Health Perspectives • Environmental Management • Environmental Pollution • Frontiers in Ecology and the Environment • Geographic Information Science • Global Change Biology • Global Ecology and Biogeography • Hydrological Processes • Journal of American Water Resources Association • Journal of Arid Environments • Journal of Ecology • Journal of Environmental...
Management • Journal of Geophysical Research – Biogeosciences • Landscape and Urban Planning • Landscape Ecology • New Phytologist • Remote Sensing of the Environment • Science Advances • Science of the Total Environment • Scientific Reports • Water Resources Research • Urban Ecosystems

Societal Memberships and Service
Member: American Geophysical Union • Ecological Society of America • International Association for Landscape Ecology

Invited Member: American Geophysical Union Hydrology Section’s Ecohydrology Technical Committee 2010-2015

Workshops and Symposia Organized
Collaborative Interdisciplinary Research for Graduate Students. Workshop at the Long Term Ecological Research Graduate Student Symposium. Blue River, OR. 2005
Case Studies of Short Term Collaborations. Workshop at the Long Term Ecological Research All Scientists Meeting Seattle, WA. 2003

Invited Workshop / Working Group Participant
Growing the Urban Forest, Socio-Environmental Synthesis Center, Annapolis, MD. February 2016
The Role of Environmental Change on the Human-Wildland Interface: The Lowland Maya as a Model System, Merida, Mexico. December 2015
Detecting Signatures of Socio-Ecological Innovation in Urban Ecosystems, Socio-Environmental Synthesis Center, Annapolis, MD. October 2015
Eddy Flux Measurements for the Groundwater-Surface Water Interaction Zone, Pacific Northwest National Laboratory, Richland, WA. September 2014
Urban Heat Island Network Workshop, St. Paul, MN. June 2013
Global Ecology Workshop. Mathematical Biosciences Institute at the Ohio State University. Columbus, OH. June 2006
Dissertation Initiative for the Advancement of Climate Change Research Symposium (DISCCRS) II. National Science Foundation. Pacific Grove, CA. March 2006
Curriculum Vitae – Jenerette, G. D.


Complex Systems Summer School. Santa Fe Institute. Santa Fe, NM. June 1997

Invited Presentations
United States – International Association of Landscape Ecologists, Asheville, NC April 2016
American Geophysical Union Fall Meeting, San Francisco, CA December 2015

Soil Science Society of America Annual Meeting, Minneapolis, MN November 2015
World Congress of the International Association of Landscape Ecologists, Portland, OR July 2015

2nd Southern California Chaparral Symposium, Arcadia, CA June 2015
American Geophysical Union Fall Meeting, San Francisco, CA December 2014

Natural History Museum, Los Angeles, CA December 2014
Pacific Northwest National Laboratory, Richland, WA September 2014
Ecological Society of America Annual Meeting, Sacramento, CA August 2014
American Association for the Advancement of Science Pacific Division, Riverside, CA June 2014

Air Pollution and Global Change Symposium, Pacific Grove, CA June 2014
International Conference of Geography and Environment, Mexico City, Mexico October 2013
University of California Los Angeles, Department of Atmospheric and Oceanic Sciences, Los Angeles, CA October 2013

University of California Agriculture and Natural Resources Statewide Conference, Ontario, CA April 2013
University of California Berkeley, Department of Environmental Science, Policy, and Management. Berkeley, CA March 2013

American Geophysical Union Fall Meeting, San Francisco, CA December 2011
University of Maryland Baltimore County, Center for Urban Environmental Research and Education, Baltimore, MD October 2011

8th World Congress International Association for Landscape Ecology, Beijing, China August 2011
Long Term Ecological Research Science Council Meeting, Jekyll Island, GA May 2011
Ecological Society of America Annual Meeting, Pittsburg, PA August 2010
University of Puerto Rico, Department of Biology, San Juan, Puerto Rico February 2010
American Geophysical Union Fall Meeting, San Francisco, CA December 2009
Xinjiang Institute of Ecology and Geography, Chinese Academy of Science. Urumqi, China September 2009
Chinese Agricultural University. Beijing, China September 2009
University of Arizona, Sustainability of Semi-Arid Hydrology and Riparian Areas (SAHRA) Tucson, AZ September 2009


South China Botanical Garden, Chinese Academy of Science. Guangzhou, China June 2008

Institute of Botany, Chinese Academy of Science. Beijing, China June 2008

University of California Irvine, Department of Earth System Science. Irvine, CA March 2008

University of California Los Angeles, Department of Civil and Environmental Engineering. Los Angeles, CA January 2008

University of Illinois Urbana-Champaign, Department of Natural Resources. Urbana-Champaign, IL March 2007

North Carolina State University, Department of Forestry and Environmental Resources. Raleigh, NC February 2007

University of California Riverside, Department of Botany and Plant Sciences. Riverside, CA February 2007

University of California Davis, College of Agricultural and Environmental Sciences. Davis, CA January 2007

Chinese Academy of Science, Institute of Botany. Beijing, China November 2006

Second International Young Scientists’ Global Change Conference. Beijing, China November 2006

Monsoon Region Climate Applications: A Binational Workshop. Guaymas, Mexico May 2006

University of Washington, College of Forest Resources. Seattle, WA May 2006

Dissertation Initiative for the Advancement of Climate Change Research Symposium (DISCCRS) II. Pacific Grove, CA March 2006

University of California Davis, Department of Plant Sciences. Davis, CA June 2005

Auburn University, School of Forestry and Wildlife Sciences. Auburn, AL May 2004

Arizona Geographic Information Council Annual Meeting. Prescott, AZ August 2003

University of New Mexico, Biocomplexity Seminar Series. Albuquerque, NM April 2003


University of Washington, Urban Ecology IGERT. Seattle, WA May 2002

**National / International Presentations** (Prior 5 Years) *(Lab members in bold)*

Rossi, RJ, DJ Bain, **GD Jenerette**. Phosphorus deposition to roadside soils: Contributions to a unique biogeochemical environment. Goldschmidt Conference, Yokohama, Japan June 2016

Tayyebi A and **GD Jenerette**. Urban heat island variation across a dramatic coastal to desert climate zone: An application to Los Angeles, CA metropolitan area. American Geophysical Union, San Francisco, CA December 2015

**Eberwein J**, C Carey, E Aronson, **GD Jenerette**. Wetting-induced pulses produced unexpectedly high emissions of N$_2$O and NO$_x$ in a desert ecosystem. American Geophysical Union, San Francisco, CA December 2015

P Oikawa, D Baldocchi, S Knox, C Sturtevant, J Verfaille, I Dronova, **GD Jenerette**, C Poindexter, Y Huang. Using eddy covariance of CO$_2$, $^{13}$CO$_2$ and CH$_4$, continuous soil respiration measurements, and phenocams to constrain a process-based biogeochemical
model for carbon market-funded wetland restoration. American Geophysical Union, San Francisco, CA December 2015


**Crum S** and **GD Jenerette**. Impacts of land use and land cover on surface and air temperature in urban landscapes. American Geophysical Union, San Francisco, CA December 2015

**Liang LL** and **GD Jenerette**. Estimation of water flux in urban area using eddy covariance measurements in Riverside, Southern California. American Geophysical Union, San Francisco, CA December 2015

**Ibsen P, S Arps, S Shiflett, GD Jenerette**. Biological and geographical sources of variation in leaf economic and hydraulic traits throughout the Los Angeles megacity. American Geophysical Union, San Francisco, CA December 2015


**Shiflett S, G Feyisa, Jenerette GD**. C Relationships between urban land surface temperature, air temperature, and NDVI across a coastal to desert climate gradient. Ecological Society of America Annual Meeting, Baltimore, MD August 2015

**Jenerette GD**. Biodiversity and ecosystem services in the Los Angeles, CA metropolitan region. International Association of Landscape Ecologists World Congress, Portland, OR June 2015

**Jenerette GD**. Carbon cycling and sequestration in chaparral landscapes. 2nd Southern California Chaparral Symposium, Arcadia, CA June 2015

**Jenerette GD**. Are ecosystem services useful for a sustainable city? American Geophysical Union Annual Meeting. San Francisco, CA December 2014

Oikawa, P, **GD Jenerette** S Knox, C Sturtevant, J Verfaille, D Baldocchi. Combining microbial enzyme kinetics models with light use efficiency models to predict CO₂ and CH₄ Ecosystem Exchange from Peatlands. American Geophysical Union Annual Meeting. San Francisco, CA December 2014

**Crum, S** and **GD Jenerette**. Land use and climate effects on soil respiration quantified with a landscape sensor network. American Geophysical Union Annual Meeting. San Francisco, CA December 2014

**Shiflett, S**, R Anderson, **GD Jenerette**. Evaporation and surface energy balance across an agricultural-urban landscape gradient in southern California, USA. American Geophysical Union Annual Meeting. San Francisco, CA December 2014


Jenerette GD. Heat wave vulnerability and mitigation in urban ecosystems. Ecological Society of America Annual Meeting. Sacramento, CA August 2014


Bytnerowicz A, W Fraczek, R Johnson, M Fenn, L Zhang, GD Jenerette. From passive samplers to estimates of dry nitrogen deposition in the western United States. American Association for the Advancement of Science Pacific Division. Riverside CA June 2014

Jenerette GD. Vegetation and Urban Climate in a Changing World. American Association for the Advancement of Science Pacific Division. Riverside CA June 2014


Jenerette GD, A Buyantuyev, S Harlan, BL Ruddell, SW Myint. Regulation and consequences of parcel-scale microclimate variation in Phoenix, AZ. United States Chapter of the International Association of Landscape Ecologists. Anchorage, AK May 2014

Crum SM, GD Jenerette. Scaling soil respiration dynamics across regional land-use and climate gradients in southern California, USA. United States Chapter of the International Association of Landscape Ecologists. Anchorage, AK May 2014


Liang L, J Eberwein, P Oikawa, GD Jenerette, DA Grantz. Carbon dioxide(CO$_2$) and nitrous oxide (N$_2$O) fluxes in an agro-ecosystems under changing physical and biological conditions. American Geophysical Union Annual Meeting. San Francisco, CA December 2013

Scott RL, TE Huxman, G Barron-Gafford, GD Jenerette, JM Young. The ecohydrological consequences of woody plant encroachment: How accessibility to deep soil water resources affects ecosystem carbon and water exchange. American Geophysical Union Annual Meeting. San Francisco, CA December 2013


Grantz DA, LY Liang, PY Oikawa, CN Fertitta, JR Eberwein, GD Jenerette. Drivers of NO$_x$, N$_2$O, and CO$_2$ in an arid biofuel production system. Association for the Advancement of Industrial Crops Annual Meeting. Washington DC October 2013

Bytnerowicz A, W Fraczek, R Johnson, GD Jenerette, EA Allen, M Fenn. From passive samplers to estimates of nitrogen deposition in arid and semi-arid areas of the western

**Velasco LM, J Hooper, GD Jenerette.** Variation in city tree ecophysiological characteristics under changing temperatures. Ecological Society of America Annual Meeting. Minneapolis, MN August 2013

**Crum SM, GD Jenerette.** Scaling soil respiration dynamics across regional land-use and climate gradients in southern California USA. Ecological Society of America Annual Meeting. Minneapolis, MN August 2013

Lan Z, Y Bai, **GD Jenerette.** N-induced biodiversity loss will persist with upscaling as beta diversity decreases by N. Ecological Society of America Annual Meeting. Minneapolis, MN August 2013

**Fertitta CN, PA Oikawa, GD Jenerette, DA Grantz.** Assessing the sustainability of *Sorghum bicolor* as a biofuel crop grown in a low desert environment: Constraints on productivity and water use efficiency. Ecological Society of America Annual Meeting. Minneapolis, MN August 2013

Avolio ML, DE Pataki, S Pincetl, TW Gillespie, **GD Jenerette, HR McCarthy.** Understanding the drivers of urban tree biodiversity in Los Angeles. Ecological Society of America Annual Meeting. Minneapolis, MN August 2013


**Clarke LW, GD Jenerette, D Bain.** Risks and benefits in urban soil: Heavy metals and nutrient content in Los Angeles Community Gardens. 2013 UC ANR Statewide Conference, Ontario, CA May 2013

**Oikawa PY, DA Grantz, A Chatterjee, JR Eberwein, LA Allsman, GD Jenerette.** Factors regulating soil CO$_2$ and NO$_x$ flux in response to high temperature, pulse water events, and nutrient fertilization. American Geophysical Union Fall Meeting. San Francisco, CA December 2012

Grantz DA, **PY Oikawa, GD Jenerette.** Carbon fluxes and yield of bioenergy Sorghum in an extreme desert production environment. American Geophysical Union Fall Meeting. San Francisco, CA December 2012

**Clarke LW, GD Jenerette, D Bain.** Risks and benefits of gardening in urban soil: Heavy metals and nutrient content in Los Angeles community gardens. American Geophysical Union Fall Meeting. San Francisco, CA December 2012

Ruddell BL, **GD Jenerette, M Moustaous, ER Vivoni, WT Chow, S Shaffer, TJ Volo, CA Martin, A Mahalov, S Harlan.** Modeling the urban climate at the human scale in a hot/dry region. American Geophysical Union Fall Meeting. San Francisco, CA December 2012

Chow WT, TJ Volo, ER Vivoni, **GD Jenerette, BL Ruddell.** Observations of the urban land surface energy balance in a Phoenix, AZ residential suburb. American Geophysical Union Fall Meeting. San Francisco, CA December 2012


Rossi R, DJ Bain, **GD Jenerette, LW Clarke.** Soil catio status in souther California: Interactions of vehicular emissions. American Geophysical Union Fall Meeting. San Francisco, CA December 2012


Teaching and Advising
Postdoctoral Advising (10 total)

PhD Student Advising (6 total)
Dion Kucera 2016-Present; Peter Ibsen 2015-present (GAANN Fellow); Holly Andrews 2015-present; Cara Fertitta 2012-present (GAANN Fellow); Steven Crum 2012-present; Jennifer Eberwein 2010-present (EPA STAR Fellow); Lorraine Weller 2008-2014

Visiting Scholar Host (6 total)

Undergraduate Research Advising (17 total)
Sandeep Aurora 2016-present; Bruno Pita 2016-present; Mia Rochford 2015-present; Sara Alpers 2015 (Bridges Fellow); Jeremy Gonzalez 2014; Neha Chandru 2013-2014; Colin Reis 2013; Ariana Contreras (CNAS Fellow, Chancellor's Research Fellow) 2012-2014; Jen Antes 2012-2013 (Bridges Fellow); Kyle Ricio 2012-2014 (Chancellor's Research Fellow); Alice Brown 2012; Sarah Juster (MRSP Fellow) 2011-2014; Angela Choi 2011-2013; Yuheng Ning 2011-2012; Anaïs Monay 2011-2012; Maeraj Sheikh 2010-2011(CNAS Fellow); Josue Jaimes 2009-2012; Justin Richardson 2009-2010; Alea Miehls 2008-2009

Courses
University of California Riverside
 Introductory Ecology and Evolution – 4 Credit, Undergraduate (470+ students)
 Introductory Organismal Biology – 4 Credit, Undergraduate (400+ students)
 Applied Ecological Modeling – 3 Credit Lecture, 1 Credit Lab, Graduate
 Landscape Ecology – 4 Credit, Graduate
 Sustainability Science – 2 Credit, Graduate
 Ethnobotany – 2 Credit, Graduate

University of Arizona
 Ecological responses to global changes – 1-3 Credit, Graduate

Arizona State University West
 Ecological Modeling – 3 Credit, Undergraduate

Invited Trainer
Collaborative Graduate Student Research Workshop, Long Term Ecological Research Student Symposium, Blue River, OR
(a). Professional Preparation
University of Utah                          Chemistry                          B.S. 1999
California Institute of Technology        Physical Chemistry                Ph.D. 2003
Indiana University                        Physical/Analytical Chemistry     2003-2005

(b). Appointments
2015-present Full Professor, Department of Chemistry University of California, Riverside
2010-2015  Associate Professor, Department of Chemistry University of California, Riverside
2005-2010  Assistant Professor, Department of Chemistry University of California, Riverside

(c). Products
(i) Related products

(ii) Other important products

(d) Synergistic Activities
Software Development. My group developed Fragmentor, which is software for the analysis of hydrogen deficient radical peptide tandem mass spectra. It is freely available online at: (http://www.faculty.ucr.edu/~ryanj/fragmentor.html).

Editorial boards. I am a member of the Editorial Board for the Journal of the American Society for Mass Spectrometry and just finished a term on the Analytical Chemistry Features Advisory Panel.

Conference Organizing. I am currently organizing the 2015 Uppcon Meeting. I just finished a 3 year term on the Asilomar Conference organizing committee for the American Society for Mass Spectrometry. I co-organized the 2014 Sanibel Conference for the ASMS.

Community Outreach. I frequently volunteer as a science fair judge and provide science demonstrations at local elementary schools. I also volunteer a significant amount of time as movie consultant and have provided scientific and creative input into two movies that are slated for production.

(e) Collaborators and other Affiliations

Collaborators (48 months):
1. Steve Blanksby  Queensland University of Technology
2. Jennifer Brodbelt  University of Texas
3. Quan Cheng  UCR
4. Josh Coon  University of Wisconsin
5. Daniel Gallie  UCR
6. Richard Hooley  UCR
7. Cynthia Larive  UCR
8. Vince Lavallo  UCR
9. Joseph Loo  UCLA
10. John McLean  Vanderbilt
11. Todd Mitchell  University of Wollongong
12. Tom Rizzo  EPFL
13. Adam Trevitt  University of Wollongong
14. Frank Turecek  University of Washington
15. Brian Volkman  Medical College Wisconsin

Ph.D. and Postdoctoral Mentors:
1. Jesse L. Beauchamp, Ph.D. Advisor
2. David E. Clemmer, Postdoctoral Co-advisor
3. Martin F. Jarrold, Postdoctoral Co-advisor

Former Graduate Students and Postdoctoral Scholars (5 years):
Postdocs
Huong Thu Pham, currently a postdoc at Memorial University
Zhenjiu Liu, currently at Monsanto
Arun Agarwal, currently with Chlorox
Total (3)
Graduate Students
Tony Ly  postdoc at University of Dundee, UK
Jolene Diedrich  postdoc at Scripps
Qingyu Sun  Bruker Daltonics
Benjamin Moore  Genentech
Xing Zhang  UCR, computer science
<table>
<thead>
<tr>
<th>Yuanqi Tao</th>
<th>Bristol-Myers Squibb</th>
</tr>
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<tr>
<td>Omar Hamdy</td>
<td>FDA</td>
</tr>
<tr>
<td>Total (7)</td>
<td></td>
</tr>
</tbody>
</table>
Mohideen, Umar

**eRA COMMONS USER NAME**

umohideen

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

<table>
<thead>
<tr>
<th>INSTITUTION AND LOCATION</th>
<th>DEGREE (if applicable)</th>
<th>YEAR(s)</th>
<th>FIELD OF STUDY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Banaras Hindu University, India</td>
<td>B.Tech.</td>
<td>1978-83</td>
<td>Engineering</td>
</tr>
<tr>
<td>The Pennsylvania State University, State College, PA</td>
<td>M.S.</td>
<td>1984-87</td>
<td>Solid State Science</td>
</tr>
<tr>
<td>Columbia University, New York, NY</td>
<td>Ph.D.</td>
<td>1987-92</td>
<td>Physics</td>
</tr>
<tr>
<td>Bell Laboratories, Murray Hill, NJ</td>
<td>Postdoc.</td>
<td>1992-94</td>
<td>Physics</td>
</tr>
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</table>

A. **Personal Statement**

We have an internationally recognized group with expertise in applying optical interferometry for precision distance measurements and also applying it for precision force measurements using microfabricated cantilevers and membranes. These techniques have been applied to precision measurements of the Casimir force, single molecule force measurements and interaction energies of SNARE proteins. The PI Mohideen has an established reputation for interdisciplinary research with faculty in the department of Cell Biology & Neuroscience (CBNS) and Bio Engineering having worked and published collaborative research for the last fifteen years.

B. **Positions and Honors.**

**Positions:**

- 2002-  Professor, Department of Physics, Univ. of California-Riverside.
- 2004-05  Vice Chair, Department of Physics, Univ. of California-Riverside.
- 2000-02  Associate Professor, Department of Physics, Univ. of California-Riverside.
- 1994-00  Assistant Professor, Department of Physics, Univ. of California-Riverside.

**Honors:**

- **Fellow**, American Physics Society.
- **Fellow**, American Association for the Advancement of Science.
- Co-author of 768 page book “Advances in the Casimir Effect” Published by Oxford University Press, Oxford, UK. Selected to be part of their premier “International Series of Monographs in Physics.”
- Plenary speaker at the 2008 Workshop on “Sixty Years of the Casimir Effect”, held from June 23rd to 27th, Brasilia, Brazil.
- Plenary speaker at the 01, 03, 05, 07, 09, Workshop on Quantum Field Theory Under the Influence of External Conditions (QFEXT01, QFEXT03, QFEXT05, QFEXT07, QFEXT09) held in Liepzg-Germany, Norman-OK, Barcelona-Spain, Leipzig-Germany and Norman-OK, respectively
- Co-organizer of 5 workshops and 2 meetings. The first workshop was organized with J.F. Babb on Casimir effects: Recent Developments held from Nov. 14 to Nov. 16, 2002 at the Institute for Theoretical Atomic and Molecular Physics at the Harvard-Smithsonian Center for Astrophysics and the Harvard Physics Department. The four workshops are on Quantum Field Theory Under the Influence of External Conditions (QFEXT03, QFEXT05, QFEXT07, QFEXT09) held in Norman-OK, Barcelona-Spain, Leipzig-Germany and
Norman-OK, respectively. The two meetings were the Sixth and Seventh A. Friedmann International Seminar on Gravitation and Cosmology held in Corsica, France, (2004), and Joao Pessao, Brazil, (2008).

- Invited physics department colloquia at 4 National Labs and at more than 21 universities.
- Fielded questions with published interviews on research from industrial trade journals, magazines and newspapers.

B. Selected peer-reviewed publications.

(10 publications selected from a total of 65 peer-reviewed journal publications based on relevance)

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: Leonard J. Mueller

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

POSITION TITLE: Professor of Chemistry

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.)

<table>
<thead>
<tr>
<th>INSTITUTION AND LOCATION</th>
<th>DEGREE (if applicable)</th>
<th>Completion Date MM/YYYY</th>
<th>FIELD OF STUDY</th>
</tr>
</thead>
<tbody>
<tr>
<td>University of Rochester, Rochester, NY</td>
<td>BS</td>
<td>05/1988</td>
<td>Chemistry</td>
</tr>
<tr>
<td>University of Cambridge, U.K.</td>
<td>CPGS</td>
<td>06/1989</td>
<td>Chemistry</td>
</tr>
<tr>
<td>California Institute of Technology, Pasadena, CA</td>
<td>PhD</td>
<td>06/1996</td>
<td>Chemistry</td>
</tr>
<tr>
<td>Massachusetts Institute of Technology, Cambridge, MA</td>
<td>Postdoc</td>
<td>06/1998</td>
<td>Chemistry</td>
</tr>
</tbody>
</table>

A. Personal Statement
As PI, I have assembled a close-knit team of scientists, all housed at UC Riverside, with expertise in biochemistry/enzymology (Dunn), X-ray crystallography (Fan), NMR spectroscopy (Mueller), organic synthesis (Hooley), and computational chemistry (Beran and Chang); our extensive published and new preliminary data show a focused and productive collaboration has been established. The goal of this research project is to establish the chemical level details in the enzymatic transformation of substrate to product in pyridoxal-5'-phosphate (PLP) dependent enzymes using a NMR crystallography – the synergistic combination of solid-state nuclear magnetic resonance, X-ray crystallography, and computational chemistry. Specifically, we are working to determine the chemically-detailed, three-dimensional structure of the substrate/analogue, co-enzyme, and side chains, allowing detailed mechanistic changes in protonation, charge states, and hybridization to be established. I have the ambition, technical expertise, and leadership skills necessary to direct this project. My graduate and postdoctoral education provided extensive training in the development and application of solid-state NMR spectroscopy and over the last ten years my research group has been at the forefront in the development and application of NMR crystallography to enzyme active sites. This work includes new experimental techniques in biological solid-state NMR and the development of ab initio computational methods to quantitatively interpret these shifts in terms of chemically-detailed, three-dimensional structures.


B. Positions and Honors

**Positions and Employment**

<table>
<thead>
<tr>
<th>Period</th>
<th>Position</th>
<th>Institution</th>
</tr>
</thead>
<tbody>
<tr>
<td>8/96 – 6/98</td>
<td>Postdoctoral Fellow</td>
<td>Massachusetts Institute of Technology</td>
</tr>
<tr>
<td>7/98 – 6/05</td>
<td>Assistant Professor of Chemistry</td>
<td>University of California, Riverside</td>
</tr>
<tr>
<td>7/05 – 6/12</td>
<td>Associate Professor of Chemistry</td>
<td>University of California, Riverside</td>
</tr>
<tr>
<td>7/05 – present</td>
<td>Vice Chair, Department of Chemistry</td>
<td>University of California, Riverside</td>
</tr>
<tr>
<td>7/12 – present</td>
<td>Professor of Chemistry</td>
<td>University of California, Riverside</td>
</tr>
</tbody>
</table>

**Other Experience**

2009-present Organizing Committee, Rocky Mountain Conference on Magnetic Resonance
2011-present Associate Editor, *Magnetic Resonance in Chemistry*

**Professional Memberships**

1995-present American Chemical Society
2002-present International Society of Magnetic Resonance

**Honors**

1988 B.S. summa cum laude
1988 Churchill Foundation Fellowship
1988 National Science Foundation Graduate Fellowship
1991 National Defense Science and Engineering Graduate Fellowship
1991 Hertz Foundation Fellowship (declined in order to accept NDSEG Fellowship)
1996-1998 American Cancer Society Postdoctoral Fellow in Chemistry, MIT
1999 Research Corporation, Research Innovation Award
2002 UCR Regent’s Faculty Fellowship
2004 NSF CAREER Award
2012 UCR Academic Senate Distinguished Teaching Award
2015 Regitze R. Vold Memorial Prize, Alpine Conference on Solid-State NMR

C. Contribution to Science

1. **NMR-Assisted Crystallography in Structural Biology:** A major goal of my research is to understand the transformation of substrate to product in enzyme active sites at the atomic level – that is to define the position of all atoms, including protons. To accomplish this, we are pioneering the development and application of NMR-assisted crystallography – the synergistic combination of solid-state NMR, X-ray crystallography, first-principles (ab initio) and molecular dynamics computational approaches, and synthetic organic chemistry – to enzyme systems. Specifically, my group is establishing the atomic-level details in the enzymatic transformation of substrate to product in pyridoxal-5'-phosphate-requiring enzymes. By doing so, we are advancing an understanding of the relationship between chemical structure, conformational dynamics, and enzyme mechanism. What will emerge will be one of the most chemically-detailed mechanistic pathways of a multi-step enzymatic transformation.


2. Resonance Assignments and Structure in Organic and Biological Solids: Resonance assignments are an essential first step in structural studies with NMR and one of my group's most sustained contributions has been in the development of scalar-coupling-driven correlation spectroscopy for organic and biological solids. In this arena, we have introduced powerful new techniques to assign through-bond connectivity in complex organic solids, effect $^{13}$C-$^{13}$C correlation at natural abundance isotope levels, and obtain 2D and 3D correlation spectra with substantially increased spectral resolution in biological solids as large as 143 kDa.


3. NMR Crystallography in Materials Science: Building on the success of this approach, we have a parallel effort underway on the development of NMR crystallography in materials science, focusing on solid-state structure and dynamics in organic photoreactions. This is an ongoing, NSF-funded collaboration with the Bardeen group at UCR. A highlight of this work involves the identification of metastable crystalline intermediates in the solid-state photoreaction of anthracene derivatives and related compounds using $^{13}$C solid-state NMR. Our paradigm-shifting results show that the photomechanical response of these molecular crystal nanostructures is determined by non-equilibrium intermediate states and cannot be predicted based solely on knowledge of the equilibrium reactant and product crystal structures.


4. Structure and Dynamics from Solid-State and Solution-State NMR: In addition to these major initiatives, my group also maintains close and vigorous collaborations with several other groups at UCR. Recently, these have led to the solid-state NMR characterization of non-Watson-Crick hydrogen bonding motifs in nucleobases – part of a longstanding collaboration with the Morton group. We have also expanded considerably our collaboration with the Larive group at UCR to characterize hydrogen bonding in oligosaccharides in solution using both NMR and molecular dynamics simulations. We have successfully predicted and observed several novel hydrogen bonding interactions that help stabilize molecular conformations in solution. Understanding how elements of local structure impact the solution conformation of oligosaccharides can potentially provide insight into the nature of polysaccharide-protein interactions. Although oligosaccharides are thought to be flexible in solution, we have found that specific structural
motifs are favored by intramolecular hydrogen bonds that restrict the conformation and that we hypothesize pre-organize the local structure for high-affinity protein binding.


**Complete List of Published Work in MyBibliography:**

**D. Research Support**

**Current Research Support**

NIH R01GM097569           Mueller (PI) 9/30/2011-8/31/2016
"Chemically-Rich Structure and Dynamics in the Active Site of Tryptophan Synthase"
The goal of this project is to determine the chemical level details for the enzymatic transformation of substrate to product in tryptophan synthase using a synergistic combination of solid-state nuclear magnetic resonance, X-ray crystallography, synthetic organic chemistry, and computational chemistry.
Role: PI

NSF DMR1508099           Bardeen (PI) 8/1/2015-7/31/2018
"Reconfigurable Molecular Crystals through Solid-State Photochemistry"
The goal of this project is to develop new techniques for preparing and probing structure and dynamics of photomechanical molecular crystals.
Role: co-PI

**Completed Research Support**

NSF DMR1207063           Bardeen (PI) 7/1/2012-6/30/2015
"Preparation and Characterization of Microscopic Photomechanical Molecular Crystals"
The goal of this project is to develop new techniques for preparing and probing structure and dynamics of photomechanical molecular crystals.
Role: co-PI

NSF DUE1140522           Eichler (PI) 7/1/2012-6/30/2015
"Developing Pedagogies of Engagement in Foundation Chemistry Courses: Enhancing Minority Retention in STEM Majors"
Role: co-PI
DAWN NAGEL, Ph.D.
Department of Botany and Plant Sciences
1129 Batchelor Hall
University of California, Riverside
Riverside, CA 92521
Email: dawnn@ucr.edu

EDUCATION
University of Georgia    Athens, GA    Ph.D., Plant Biology        2003 - 2008
University of Georgia    Athens, GA    B.S., Biology              1998 - 2000

RESEARCH EXPERIENCE
Assistant Professor: University of California, Riverside  06/2016 - present
The long term goal of my research is to understand the underlying regulatory mechanisms of how the circadian clock modulate the plant’s ability to sense and respond to temperature stress. We use functional genomics, genetics and a variety of genome-scale approaches to address these questions. Mechanistic discoveries from my proposed research will contribute to the development of crop cultivars that are better resistant to temperature extremes.

Postdoctoral Fellow: Dr. Steve Kay, The Scripps Research Institute, La Jolla  06/2009 – 06/2016
(Previously at University of California, 2009-2014, San Diego and University of Southern California, 2014-2016, The Scripps Research Institute, La Jolla 02/2016 – 06/2016). Goals were to understand mechanistically how circadian clock genes are regulated to sustain robust rhythms, and in turn regulate numerous biological pathways. I used functional genomics approaches in combination with a variety of molecular and genomic techniques to screen for novel regulators underlying clock function, and to discover and characterize clock controlled transcriptional targets regulating key biotic and abiotic stress responses.

Postdoctoral Scholar: Dr. Susan Wessler, University of Georgia  01/2009 – 05/2009
Designed and performed computational analyses to identify and characterize transposable elements in the sequenced maize genome.

Graduate Research Assistant: Dr. Susan Wessler, University of Georgia  08/2003 – 12/2008
Combined computational and experimental approaches to determine the content and understand the impact of transposable elements on eukaryotic genomes.

Research Assistant/Coordinator: Dr. Susan Wessler, University of Georgia  01/2000 – 07/2003
Conducted experiments relevant to research projects in the lab. Assisted with supervision of undergraduate students and provided general lab support.

Undergraduate Student: Dr. Susan Wessler, University of Georgia  03/1998 – 12/1999
Performed experiments under the supervision graduate students. Maintained the lab, including buffer preparation and ordering supplies. Provided technical assistance to members of the lab.

AWARDS
2013 NAASC International Conference on Arabidopsis Research Under-represented Minority Funding
2012 NAASC International Conference on Arabidopsis Research Under-represented Minority Funding
2010 National Institute of Health Ruth L. Kirschstein National Research Service Awards for Individual Postdoctoral Fellowships
2006 UGA Center for Undergraduate Research Opportunities Excellence in Undergraduate Mentoring Award.
PUBLICATIONS


TEACHING EXPERIENCE

2015 Lecturer: BIMM116/PSYC133 - Circadian Rhythms - Bio Clocks (PI: Susan Golden). Lectured a class of ~300 students on the Plant Circadian Clock. Designed and conducted in class concept learning activities for three sections.

2006 **Workshop Contributor: University of Georgia.** Contributed to a one-week training module for two high school teachers from High Tech High Los Angeles on how to search and identify transposable elements using the available genomic sequences at NCBI.

2003 and 2004 **Graduate Teaching Assistant: Biology 2107 Honors University of Georgia.** Provided assistance to students related to the course work and graded quizzes and exams. Held review and study sessions to assist students with relevant course work.
PRESENTATIONS
Invited Speaker:
2014 Gordon Research Conference: Plant Molecular Biology, Holderness NH. Transcriptional targets of clock controlled outputs.
2007 University of Georgia Plant Biology Graduate Student Symposium, Athens GA. Developing an active assay for Lotus japonicus transposable elements.
2004 EMBO Workshop on Molecular Mechanisms of Transposition, its Regulation and Evolution, Roscoff, France. Transposable elements in Model Legumes.

Poster presentations:
2014 Gordon Research Conference: Plant Molecular Biology, Holderness NH. Transcriptional targets of clock controlled outputs.
2013 The 24rd International Conference on Arabidopsis Research (ICAR), Sydney, Australia. A Novel Circadian Clock Regulator in Arabidopsis.
2012 The 23rd International Conference on Arabidopsis Research (ICAR), Vienna, Austria. A Novel Circadian Clock Regulator in Arabidopsis.
2006 University of Georgia Plant Center Retreat, Lake Lanier GA. Developing an active transposon assay for Lotus Transposable Elements.
2003 Plant Transposon Meeting, Iowa State University, Ames IA. Functional analysis of the two ORFs of the active rice Pong element.

MENTORING EXPERIENCE
2013 – present Online Mentor for American Society of Plant Biologists (ASPB) Planting Science Mentoring Program.
2005 – 2007 Mentored undergraduate research students Deep Shah and Paul Ruddle. Designed small projects to identify transposable elements in plants, and conducted experiments to test several hypotheses.
2002 – 2003 Mentored minority undergraduate research student Tesheka Stevenson, who recently graduated with her Ph.D from the Department of Genetics and Molecular Biology at Emory University.

OUTREACH/VOLUNTEER SERVICE
2010 – 2011 Served as a postdoc representative on the Division of Biological Sciences Biology/Salk Retreat Planning Committee. Designed and organized activities to enhance interaction and mentorship between postdocs and faculty.
2010 Volunteered at the San Diego Festival of Science and Engineering, as a postdoc representative of UCSD, in the section on “Ask me I am a Scientist”.

August 5th, 2016

Russ Hille,
Distinguished Professor of Biochemistry,
University of California, Riverside,
2404 Boyce Hall,
Riverside, CA 92521-0122.

Re: Interdepartmental Graduate Program in Biophysics

Dear Russ,

I would like to express my enthusiastic support for the proposed Interdepartmental Graduate Program in Biophysics at the University of California, Riverside.

During my past six years as a postdoctoral researcher at Stanford University School of Medicine, I was involved both in performing and in mentoring trainees in Biophysics research, focusing on applications of single-molecule fluorescence microscopy to study complex biochemical systems. Our research was a natural fit for, and benefitted enormously from students in the Biophysics program. The potential of a similar program at UCR is therefore really exciting. I will be delighted to participate in the program as it is established.

If I can assist in any way, please do not hesitate to contact me.

Sincerely,

Seán O’Leary
Curriculum Vitae

Seán O’Leary

Personal Information:

Address: Department of Biochemistry,
University of California, Riverside,
3488B Boyce Hall,
Riverside, CA 92521.

Phone: +1 (951) 827-4222
E-mail: sean.oleary@ucr.edu

Education:

2010  Ph.D., Chemistry and Chemical Biology, Cornell University
  Dissertation: “Exploring Novel Enzymology in Bacterial Metabolism: Cysteine Synthase, Urate Oxidase, and Bacimethrin Biosynthesis.”
  Advisor: Tadhg P. Begley

2008  M.S., Chemistry and Chemical Biology, Cornell University

2005  B.Sc.(Hons), Chemistry, University College Dublin, Ireland

Research Experience:

2016 –  Assistant Professor of Biochemistry, University of California, Riverside

2014 – 2016  Basic Life Sciences Research Associate and
2010 – 2014  Postdoctoral Scholar, Stanford University School of Medicine
  Project: Single-molecule, biophysical and biochemical studies on eukaryotic translation initiation
  Advisor: Joseph D. Puglisi

2009 – 2010  Research Assistant, Texas A&M University
  Projects: Biochemical studies on PKS11, a type-III polyketide synthase from M. tuberculosis.
  Reconstitution and characterization of bacimethrin biosynthesis.
  Advisor: Tadhg P. Begley

2005 – 2009  Graduate Research Assistant, Cornell University
  Projects: Pre-steady-state kinetic studies on CysM, a cysteine synthase from M. tuberculosis.
  Biochemical characterization of HpxO, a novel flavin-dependent urate oxidase from Klebsiella pneumoniae.
  Investigation of the trapping of a glycosyl cation at the active site of crystals of uridine phosphorylase from Escherichia coli and Bos taurus.
  Studies on the biosynthesis of bacimethrin.
  Studies on the mechanism of formation of the DNA dimeric thymine lesion known as the “spore photoproduct”.
  Advisor: Tadhg P. Begley

Honors and Awards:

2014 –  NIH Pathway to Independence Career Development Award (K99/R00) (GM111858)
2011  Dean’s Postdoctoral Fellowship, Stanford University School of Medicine
2006  Hugh Ryan Memorial Medal, University College Dublin
2005  Eva Philbin Bowman Medal, University College Dublin
2004  University Scholarship, University College Dublin
2003  University Scholarship, University College Dublin
2002  University Scholarship, University College Dublin *(Two scholarships)*
2001  Entrance Scholarship, University College Dublin

**Publications:**


**Invited talks:**

2. Uppsala University, Uppsala, Sweden, 8/10/2016.

Jeff Perry, Ph.D.
Jeff.perry@ucr.edu
Department of Biochemistry, UC Riverside 3401 Watkins Drive, Riverside, Ca 92521.

Professional Appointments:

Oct 2014 - Present  Assistant Professor of Biochemistry, University of California, Riverside.

Oct 2015 - Present  Adjunct Professor, Universidad Francisco de Vitoria, Madrid, Spain.

Jan 2015 - Present  Co-Founder, Arma Pharmaceuticals Inc., Delaware.


Oct 2005 - Present  Adjunct International Professor, School of Biotechnology, Amrita University, India.

Education:

July 2001  Ph.D. Natural Science, University of Cambridge, UK.
Advisor: Sir Tom L. Blundell, FRS, FMedSci, PhD, Head of Biochemistry Department.

June 1996  B.Sc. Imperial College of Science Technology and Medicine, UK.
Biochemistry with a Year in Industry (Hons).

Research and Training Experience:

2011-2014  Staff Scientist, The Scripps Research Institute, Department of Integrative Structural and Computational Biology, La Jolla, Ca.

Advisor: Dr. John A. Tainer.
Project: Structural biochemistry studies DNA repair and genome stability pathways.

2001-2006  Postdoctoral Fellow, Lawrence Berkeley National Laboratories & Visiting Scientist, TSRI.
Advisors: Dr. John A. Tainer & Dr. Priscilla K. Cooper.
Project: Structural biochemistry studies DNA repair and genome stability pathways.

1996-2001  Ph.D. Student, University of Cambridge, Department of Biochemistry, UK
Advisor: Prof. Sir Tom L. Blundell, FRS, FMedSci,
Project: Structural Biochemistry Studies on Cell Surface Glycoproteins.

1996  Research Student, Computational Chemistry Department, Pfizer Central Research Ltd, UK.
Advisor: Dr. David G. Brown.  Project: Analyses of neutrophil inhibitory factor

1996  Undergraduate Research Project Student, Imperial College, UK
Advisor: Dr. K. Brown.  Project: Cloning and Characterization of M. tuberculosis KATG.

1995  Undergraduate Industrial Placement, Glaxo-Welcome, UK
Advisor: Dr. Onkar Singh, Project: Biochemical characterization of the HIV-1 Rev protein.
New Investigator NIH Extramural Grant Support:
NIH/NIAMS New Investigator R03 AR059968-01A1 (PI) 07/01/2011 – 03/31/2015
“Structural Biochemistry Studies on MAP Kinase Allosteric Binding Sites”

NIH/NIGMS The HIV Interaction and Viral Evolution (HIVE) Center P50 GM103368 (Lead PI – Olson)
Collaborative Development Program Award on “Advanced SAXS technologies for HIVE center studies”
(Awarded as a Subcontract to Tainer & Perry as co-PIs) 03/01/2013 – 08/01/2014

Grant Applications In Preparation/Re-Submission:
“Roles of RNF4 at dysfunctional telomeres” NIH R01 (Boddy/Perry/Lazzerini-Denchi)
“A Unicellular Model for Determining DNA Repair Functions of the RecQ4 Disease-Suppressing Helicase”
NIH R01 (Boddy/Perry)
“Defining WD-repeat protein:small molecule interactions” NIH R01 (Perry/Reed/Cheltsov)
“Targeting Arm1 for cancer chemotherapy selectivity” NIH SBIR (Hoelz/Perry)
“A Novel therapeutic target for treating Parkinson's disease” NIH R01 (Perry/Reed/Cheltsov)

Honors and Awards:
1996-2000 Pfizer Central Research Ltd, UK, CASE sponsored Ph.D. studentship

Skills and Interests:
- Discovery of novel components in the SUMO and Ubiquitin post-translational modification pathways.
- Extensive experience in the production of protein crystals, collection and analysis of diffraction, and subsequent data analysis, structure determination, model building and refinement, and pdb submission.
- Experienced in small angle x-ray scattering methods.
- Adept in molecular biology, protein expression, purification and protein biochemistry methods.
- Skilled in structural bioinformatics analyses, including protein comparative modeling.
- Experienced in crystallographic, computational and biochemical methods in structural-based drug design.
- Extensive experience in both writing and in reviewing manuscripts and grants.

Scientific Achievements:
- Authorship of 4 manuscripts highlighted in the Faculty of 1000.
- Reviewer of 60 manuscripts for leading journals (Nature, Cell, Nature Struct & Mol Biol, etc)
- Reviewer of 17 grant applications (EBI, USA, Wellcome Trust, UK, M.R.C., UK, etc).

Teaching Experience:
2014-present Biochemistry UG courses at UCR, BCH-10, 96, 97 98i, 100, 110A & 120, 197.
2005-present Teaching ‘Structural Bioinformatics’ course for Bioinformatics MSc, and ‘Structure-based Drug Discovery’ for Biotechnology and Microbiology MSc degrees, Amrita University, Kerala, India.
2004-present Supervision of laboratory technicians, graduate students and post-doctoral fellows.
1999-2000 Biochemistry undergraduate tuition, St. Edmund’s College, University of Cambridge, UK.

PDBs:
Human MnSOD structures: 1SZX, 1XDC, 1XIL, 1ZSP, 1ZTE, 1ZUQ, 2GDS & 2P4K.
Human WRN Exonuclease Structures: 2FBT, 2FBV, 2FBX, 2FBY & 2FC0.
Human p38a Kinase inhibitor complex: 3HVC.
Human Sumo Like Domain: 3RD2; Yeast Sumo Like Domain: 3GOE.
Yeast Sumo Like Domain-Ubc9 SUMO E2 complex: 3RCZ.
Human RNF4 RING Domain: 4PPE.

Patents: Two patents filed.
Invited Presentations:

1) ‘RNF4 DNA Repair Functions at Telomeres’, Dynamic Structures in Damage Responses and Cancer, Cancun, Mexico, Feb 2014.
3) ‘SAXS at the SIBYLS beamline’, HIVE Structural Biology Workshop, Bethesda, June 2013.

Publications:


NICOLE E. RAFFERTY
Department of Biology | University of California-Riverside | Riverside, CA 92521
951.827.3800 | nicole.rafferty@ucr.edu | www.raffertylab.ucr.edu

Education

Ph.D. in Zoology (2011)
University of Wisconsin-Madison
Advisor: Anthony Ives

M.S. in Zoology (2006)
University of Wisconsin-Madison
Advisor: Janette Boughman

University of Washington
Advisor: Dee Boersma
magna cum laude, Distinction in Biology, Phi Beta Kappa

Academic Appointments

2017-present Assistant Professor
Department of Biology
Cooperating Faculty Member
Department of Entomology
University of California-Riverside

2016 Research Associate
Department of Entomology
Affiliate: Center for Environmental Research, Education, and Outreach
Washington State University

2015 Postdoctoral Fellow
Department of Ecology and Evolutionary Biology
University of Toronto
Mentor: James Thomson

2011–2014 NIH Fellow
Postdoctoral Excellence in Research and Teaching Program
Department of Ecology and Evolutionary Biology; Center for Insect Science
University of Arizona
Mentor: Judith Bronstein

Publications

* indicates mentored student

Published or In Press


- *Editor’s Choice article*
- *Journal cover photo*


- *Recommended by Faculty of 1000*
- *Journal cover photo (credit: David W. Inouye)*


- *Featured on journal cover*


- *Journal cover photo*
- *Popular press by Science Daily and Treehugger*


- *Journal cover photo*


In Revision or Review


Grants, Fellowships, and Awards

<table>
<thead>
<tr>
<th>Year</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>Research Grant, Washington Tree Fruit Research Commission PI with 3 co-PIs ($76,634) “Development and validation of a precision pollination model”</td>
</tr>
<tr>
<td>2015</td>
<td>Ecology and Evolutionary Biology Departmental Postdoctoral Fellowship, University of Toronto</td>
</tr>
<tr>
<td>2011-2014</td>
<td>Postdoctoral Excellence in Research and Teaching Fellowship, NIH</td>
</tr>
<tr>
<td>2010</td>
<td>John Jefferson Davis Travel Award, University of Wisconsin ($400) John and Virginia Emlen Award for Outstanding Graduate Work in Zoology, University of Wisconsin ($4,500)</td>
</tr>
<tr>
<td>2009</td>
<td>Carl A. Bunde Graduate Research Award, University of Wisconsin ($4,500)</td>
</tr>
<tr>
<td>2004-2007</td>
<td>Graduate Research Fellowship, NSF</td>
</tr>
<tr>
<td>2006</td>
<td>Research Grant, American Society of Primatologists ($1,445)</td>
</tr>
<tr>
<td>2006</td>
<td>Graduate Research Grant, University of Wisconsin ($1,315)</td>
</tr>
<tr>
<td>2003</td>
<td>Research Apprenticeship Grant, Friday Harbor Marine Labs ($3,000)</td>
</tr>
</tbody>
</table>

Presentations

Invited Talks: Conferences


**Invited Talks: Departmental Seminars and Other Venues**

2017 Department of Ecology and Evolutionary Biology, University of California-Los Angeles

2016 School of Biological Sciences, Washington State University
Department of Entomology, University of California-Riverside
Palouse Ecology, Evolution and Systematics, Washington State University and University of Idaho
Department of Biology, University of North Carolina
Department of Biology, University of California-Riverside

2014 USA National Phenology Network Headquarters, Tucson, Arizona
Department of Biology, Eastern Michigan University

**Contributed Talks and Posters: Conferences**


**Contributed Talks: Departmental Seminars and Other Venues**

2015 Department of Ecology and Evolutionary Biology, University of Toronto

2011 Department of Ecology and Evolutionary Biology, University of Arizona
Biology Colloquium, University of Wisconsin

**Teaching Experience**

2017 *Ecological Communities Under Global Change*
Department of Biology
University of California-Riverside

2016 *General Entomology* (writing-intensive)
Department of Entomology
Washington State University

RAFFERTY – Curriculum Vitae 4
Environmental Biology (integrated lecture & lab)
Department of Biology
Pima Community College

Professional Service

Associate Editor, *Journal of Ecology* (2013-present)


Proposal Reviewer, Resource Conservation and Climate Change Program Area, Strategic Environmental Research and Development Program, Department of Defense (2016)


Proposal Reviewer, National Fellowship Program, Sigma Delta Epsilon/Graduate Women in Science (2015)


Co-organizer, Women in Natural Sciences, Panel discussions and seminars on professional issues for women in ecology and related disciplines, Department of Ecology and Evolutionary Biology, University of Arizona (2013-2014)


Invited Participant, USA National Phenology Network Research Coordination Network Meeting, Milwaukee, Wisconsin (2012)

Student Mentoring

*University of California-Riverside:*
Andrea Keeler (2017-present), Ph.D. student
Skyler Kim (2017), undergraduate
Eva Morton (2017), undergraduate
University of Arizona:
Victoria Scaven (2012-2014), undergraduate
Devon Makki (2014), undergraduate
Meghan Iacuelli (2013), undergraduate
Xi Chen (2011), undergraduate

University of Wisconsin:
Abigail Smith (2008-2009), undergraduate

Public Service and Outreach

Judge, 11th Annual Undergraduate Research Symposium, University of California-Riverside (2017)
Consulted on piece on spring flowering and plant-pollinator synchrony for Science Friday, National Public Radio (2017)
Judge, Showcase for Undergraduate Research and Creative Activities, Washington State University (2016)
Judge, Ecology and Evolutionary Biology Undergraduate Poster Session, University of Arizona (2014)
Volunteer, Arizona Insect Festival, University of Arizona (2013, 2014)
Judge, Flowing Wells High School Science Fair, Tucson, Arizona (2012)
Invited Speaker, “Climate change and shifts in flowering time: effects on plant-pollinator interactions”, 11th Annual Science Day, University of Wisconsin Arboretum (2011)
Invited Speaker, “Climate change-induced shifts in flowering phenology and plant-pollinator interactions”, 9th Annual Science Day, University of Wisconsin Arboretum (2009)

Professional Memberships

American Society of Naturalists
Botanical Society of America
British Ecological Society
Ecological Society of America
Carolyn G. Rasmussen
Department of Botany and Plant Sciences
University of California, Riverside
900 E. University Ave.
Riverside, CA 92521
(951) 827-4415
carolyn.rasmussen@ucr.edu

EDUCATION

2007 University of California, Berkeley
Ph.D. in Microbiology; Department of Plant and Microbial Biology
"Characterization of genes required for septation and cell fusion in Neurospora crassa." Research Advisor: Professor N. Louise Glass

1998 University of Chicago
B.A. in Chemistry, General Honors, Honors in Chemistry
"The regulation of expression of expansins in the parasitic plant Striga asiatica." Research Advisor: Professor David G. Lynn

RESEARCH AND PROFESSIONAL EXPERIENCE

07-2014-present Assistant Professor in Plant Cell Biology and Plant Cell Biologist

2013-2014 Principal Investigator, University of Wyoming, Molecular Biology
NSF-MCB award #1244202

2011-2013 Postdoctoral Researcher, University of Wyoming, Molecular Biology
Postdoctoral Advisor: Professor Anne W. Sylvester

2007-2011 American Cancer Society Postdoctoral Research Fellow
University of California, San Diego, Cell and Developmental Biology
Postdoctoral Advisor: Professor Laurie G. Smith

2000-2007 Graduate Student, Graduate Group in Microbiology
University of California, Berkeley, Plant and Microbial Biology
Graduate Student Advisor: Professor N. Louise Glass

PUBLICATIONS

2017 Martinez, P., Luo, A., Sylvester, A. W., and Rasmussen, C. G. Proper division plane orientation and mitotic progression together allow normal growth of maize. PNAS
doi:10.1073/pnas.1619252114

Contributions:
Most of the work on this paper was done at UCR. Some tool development and strain generation was done at University of Wyoming. Pablo Martinez, UCR graduate student
in the Rasmussen lab, performed the majority of experiments and prepared most of the figures and helped write the manuscript. Anding Luo and Anne W. Sylvester, University of Wyoming postdoc and Professor respectively, contributed new tools. Carolyn Rasmussen directed the research, contributed new tools, assembled some figures, did some experiments, wrote the manuscript, and is the corresponding author.


Contributions:
Most of the work on this paper was done at UCR. Some tool development and initial experiments were done at University of Wyoming. Ricardo Mir, a UCR postdoc in the Rasmussen Lab, performed the majority of experiments and made most of the figures and helped write the manuscript. Leslie Aranda, a UCR undergraduate researcher performed some experiments. Tiffany Biaocchi, UCR graduate students first quantified the DII signal in telophase and G1 cells. Anding Luo and Anne W. Sylvester, University of Wyoming postdoc and professor respectively, contributed new tools. Carolyn Rasmussen directed the research, contributed new tools, assembled some figures, did some experiments, wrote the manuscript, and is the corresponding author.


Contributions:
Carolyn Rasmussen (UCR) developed the quantitative live cell imaging technique and wrote a methods book chapter on it.

2013 Rasmussen, C.G., Wright A.J., and Müller, S. The role of the cytoskeleton and associated proteins in determination of the plant cell division plane. The Plant Journal. 75: 258–269.

*Authors contributed equally to this work


* Authors contributed equally to this work

2008 Rasmussen, C.G., Morgenstein, R.M., Peck, S. and Glass, N.L. Lack of the GTPase RHO-4 in Neurospora crassa causes both reduced numbers and aberrant stabilization of

(Cover photograph)


(Highlighted in *Nature Reviews Microbiology* 5, 659 (2007), Cover photograph)


**TEACHING EXPERIENCE**

**Supervisor of Graduate Student Research**
Pablo Martinez, Biochemistry and Molecular Biology (BCMB) graduate student, started 10/2015
Marshal Bellinger, Plant Biology (PB) graduate student, started 01/2016
Alison Mills, Biochemistry and Molecular Biology (BCMB) graduate student, started 3/2017

**Rotation students**
Leticia Meza PB (Fall 2017), Danielle Garceau PB (Winter 2016), Leo Islas Genetics, Genomics and Bioinformatics (Fall 2015), Tiffany Biaocchi BCMB (Winter 2015), Michael Schwartz PB (Winter 2015).

**Supervisor of Undergraduate Research**
2014-current Leslie Aranda – MARC-U-STAR awardee, co-author
2015-current McKenzie Pickle- NSF-REU awardee, ASPB SURF awardee
2015-current Victoria Morris – HHMI- SALSA awardee, ASPB SURF awardee
2015-current Sareen Leon
2016-current Grecia Lizaola-Velazquez, Raquel Diffenbacher, Jocelyne Aranda (RISE scholar awardee 2017), Danielle Thomas (RISE scholar awardee 2017), Tammy Peng (Dynamic Genome HHMI SALSA awardee 2017)
2014 Christoper Hoyt- NSF-REU awardee
2014 Jenna Roper – MARC-U-STAR awardee

**Teaching**
BPSC011 Plants and Human Affairs, undergraduate level 4-unit class (Winter Quarters)

BPSC237 Plant Cell Biology, graduate level 4-unit class co-taught with Professor Zhenbiao Yang (Fall Quarters)
BPSC 240 Mathematical modeling in patterning and cell shape (Winter Quarter, 2015).
BPSC 250 (Fall Quarter, 2014 and Winter Quarter 2017 with Zhenbiao Yang).

FUNDING AND AWARDS

Pending

2017  Hellman Fellowship ($30,000 requested)
2017  USDA Hispanic Serving Institution Education grant ($249,150 requested, PI with 3 UCR Co-PIs David Nelson, Linda Walling and Patricia Springer)
2017  UCR-Research Support Allocation Process (RSAP, $17,500 requested)
2016  NSF-MCB (PI, $870,309 requested)

Funded

2015  UCR Omnibus Travel Award ($1,400)
2015  Internal Research and Education Development (RED) grant for Mathematical modeling ($10,000)
2014-2015  IIGB Internal Chemical genomics grant ($5,000)
2013-2018  NSF-MCB (Cellular Dynamics and Functions) proposal #1244202 and 1505848 ($521,024.00)
2008-2011  American Cancer Society Postdoctoral Fellowship #PF-08-280-01 ($148,000)
2008  Finalist for Life Sciences Research Fellowship LSRF (No money awarded)
2006  Graduate Division Travel Grant UC Berkeley ($500)
2004  David D. Perkins Award for Neurospora Research ($100)
2004  Department of Plant and Microbial Biology Travel Grant ($500)
2001  National Science Foundation Graduate Fellowship Honorable Mention
2001  Patricia St. Lawrence Graduate Fellowship ($3,500)

TALKS AND SEMINARS

2017  Keynote speaker, Annual Conference of the Nordic Microscopy Society, SCANDEM, Reykjavik, Iceland.
2017  Invited talk, 59th Annual Maize Genetics Conference, Saint Louis, MO
2017  Seminar, University of Georgia, Athens, GA
2016  Invited talk, Gordon Research Conference, Plant and Microbial Cytoskeleton, Andover, NH.
2016  Invited talk, Plant Cell Dynamics Meeting, Saint Louis, MO
2016  Seminar, Penn State University, PA
2015  Seminar, CMBD-GGB-MCBL joint seminar series, UCR, Riverside, CA
2014  Invited talk, Twelfth Annual Award Symposium, Center for Plant Cell Biology (CEPCEB), UCR, Riverside, CA
2014  Seminar, University of Saskatchewan, Saskatoon, Canada
2013  Seminar, University of California, Riverside, CA
2013  Seminar, University of California, Davis, CA
2013  Seminar, University of British Columbia, Vancouver, Canada

Carolyn G. Rasmussen CV page 4
2012  Invited talk, American Society for Plant Biology (ASPB) Conference, Austin, TX
2012  Invited talk, 54th Annual Maize Meeting, Portland, OR
2011  Seminar, Plant Gene Expression Center, USDA, Albany, CA
2011  Invited talk, Cell Cycle Symposium, Salk Institute, San Diego, CA
2011  Invited talk, San Diego Center for Systems Biology (SDCSB), UC San Diego, CA
2011  Invited talk, La Jolla Mesa Plant Biology Talks, UC San Diego, CA
2010  Seminar, John Innes Center, Norwich, UK
2010  Invited talk, American Society for Plant Biology (ASPB) Conference, Montreal, Canada
2010  Invited talk, Plant and Microbial Cytoskeleton Gordon Research Conference (GRC), Andover, NH
2009  Plant Development Supergroup, UC San Diego, CA
2008  Plant Development Supergroup, UC San Diego, CA
2007  Invited Seminar, Centro de Investigacion Cientifica y de Educacion Superior de Ensenada (CICESE), Ensenada, Mexico
2006  Genetics and Development Supergroup, UC Berkeley, CA
2005  Fungal Genetics Conference, Asilomar, CA.
2005  Invited Seminar, Max Plank Institute, Marburg, Germany
2005  Invited Seminar, Applied Microbiology, University of Basel, Switzerland.
2004  Neurospora Conference, Asilomar, CA
2004  Seminar, UC Davis, CA 2004
2002  Graduate Student Microbiology Symposium, UC Berkeley, CA
2002  Neurospora Conference, Asilomar, CA.

SYNERGISTIC ACTIVITIES

2017  Lab outreach activities for Plant Discovery Day (at UCR) and Science Night for Stork Elementary School
2017  Grant review Laboratory of Excellence Saclay Plant Science (Labex SPS)
2016  Reviewer for journal articles in Plant Cell (2), Plant Physiology and Developmental Biology
2015  Reviewer for journal articles in Molecular Plant, Plant Cell
2015  Activities leader for Plant Discovery Day 5/2015
2015  Grant review DOE-BES
2014-2016 Maize Editorial Board
2014  Mentorship panel for Postdocs “From Trainee to Tenure-Track Faculty: How to Navigate Within the Academic System to Reach the Top of the Pyramid.” Dec 9
2014  Grant review for NSF-IOS and BBSRC.
2014  Reviewer for journal articles in PLOS-ONE, Plant Cell Reports
2013-2014 Activities leader for Women in Science (WIS) conference at UW.
2010-2014 Member of professional societies AAAS and ASPB.
2011  Ad hoc reviewer for the Plant Journal.
2011  Science Fair Expo Day “Ask Me, I’m a Scientist or Engineer” volunteer.
2009-2012 American Cancer Society Cancer Action Network (ACS CAN) Member.
2009-2010 Participant in Making Strides Against Breast Cancer fundraising walk.

Carolyn G. Rasmussen CV page 5
2008-2009 Activities leader for several one-day events and curriculum development for BioBridge, a program that promotes scientific leadership in traditionally underserved high school students at University of California, San Diego.

REFERENCES

**Professor Anne W. Sylvester** (Postdoctoral research advisor)
Department of Molecular Biology
224 AnSci/MOLB
1000 E. University Ave
Laramie, WY 82071
307-766-4993 [annesyl@uwyo.edu](mailto:annesyl@uwyo.edu)

**Professor Laurie G. Smith** (Postdoctoral research advisor)
Section of Cell and Developmental Biology
5218 Muir Biology - MC 0116
9500 Gilman Drive La Jolla, CA 92093-0116
858-822-2531 [lgsmith@ucsd.edu](mailto:lgsmith@ucsd.edu)

**Professor N. Louise Glass** (Dissertation advisor)
Plant and Microbial Biology
111 Koshland Hall Rm. 341A
Berkeley, CA 94720-3102
510-643-2399 [lglass@berkeley.edu](mailto:lglass@berkeley.edu)
LOUIS S. SANTIAGO
Botany and Plant Sciences
University of California
2150 Batchelor Hall
Riverside, CA 92521
Tel: 951-827-4951
Fax: 951-827-4437
email: santiago@ucr.edu
Faculty web page: http://plantbiology.ucr.edu/people/faculty/santiago.html
Lab web page: http://ecophys.ucr.edu/
Google Scholar Citations: http://scholar.google.com/citations?user=qxbpxTsAAAAJ&hl=en

Education

2003 PhD in Botany, University of Florida
1998 MS in Botany, University of Hawaii at Manoa
1993 BA in Integrative Biology, University of California at Berkeley

Other Education:
2002 Stable Isotope Ecology Course, University of Utah
2009 Mass Spectrometer Operator Course, University of Ottawa

Professional Experience

• Associate Professor of Physiological Ecology, Botany and Plant Sciences, Associate Physiological Ecologist, Agricultural Experiment Station, University of California, Riverside (UCR), 2012 – present

• Assistant Professor of Physiological Ecology, Botany and Plant Sciences, Assistant Physiological Ecologist, Agricultural Experiment Station, UCR, 2006 – 2012

• Research Associate, Smithsonian Tropical Research Institute, 2011 – present

• Co-Director, Facility for Isotope Ratio Mass Spectrometry, UCR, 2008 – present

• NSF Minority Postdoctoral Research Fellow, Integrative Biology, University of California, Berkeley, and Center for Scientific Investigation of the Yucatan (CICY), Merida, Mexico, 2003 – 2006

• Environmental Protection Agency – Science to Achieve Results (STAR) Graduate Research Fellow, 2000 – 2003

• Graduate Research and Teaching Assistant, 1995 – 2003

• Editorial Assistant, Mondo 2000 Publishing, Berkeley, CA, 1994
Grants, Awards and Fellowships


- “Air pollution studies: Understanding the deposition behavior and plant responses to gaseous ammonia pollution”. Principal Investigator, USDA Forest Service, 2015-2019 $15,000.

- “Hydraulics and Sap of Trees from the Amazonian Tropics (HydroSTAT)”. Co-Principal Investigator with Damien Bonal, Center for the Study of Amazonian Biodiversity (CEBA), 2014 $25,000.

- “DRrought And Mortality in Amazonian forests (DRAMA)”. Co-Principal Investigator with Damien Bonal, Center for the Study of Amazonian Biodiversity (CEBA), 2013 $25,000.


- “Invasive Species in Wilderness”. Principal Investigator, Bureau of Land Management, current, 2012-2016 $13,000.

- “Ecosystem Ozone (O3) Flux and Stomatal Uptake: Assessment of Environmental Controls and Functional Responses of Mixed Conifer Sites Along Two Pollution Gradients”. Co-Principal Investigator with Karrin Alstad, USDA Forest Service 2012-2013 $72,000.

- USDA E. Kika de la Garza Fellowship, United States Department of Agriculture, Washington DC, July-August 2011.

• “Physiological and Biochemical Characterization of the Effects of Oxidant Air Pollutants, Ozone and Gas-Phase Nitric Acid on Plants and Lichen for Their Use as Early Warning Biomonitor of these Air Pollutants”. Co-Principal Investigator with Pam Padgett, USDA Forest Service, 2009-2010 $29,000.

• “Nutrient Limitation of Photosynthesis in Tropical Forest”. Principal Investigator, University of California, Regent’s Faculty Fellowship, 2009-2010 $4,500.

• “Consequences of drought-induced vegetation change for water cycling in desert chaparral”. Principal Investigator. National Science Foundation, 2008-2011 $175,000.


• Principal Investigator. UCR Travel Grants, 2008-2009 $2,040.

• “Using Stable Isotopes to Identify the Components of Forest Canopy Evapotranspiration”. Principal Investigator, National Science Foundation, 2007-2008 $50,000.


• “Cooperative Research and Training in Stable Isotope Methods: Applications in ecology, agriculture, and food chemistry”. UC Mexus 2006-2007 $15,000.

• “Physiological Responses of Redwood Forest Understory Plants to Water and Nitrogen Inputs by Fog”. Principal Investigator, National Science Foundation Postdoctoral Fellowship, 2003-2006 $150,000.

• “Symbiotic Nitrogen Fixation and Patterns of Species Diversity in a Tropical Dry Forest in Mexico”. Principal Investigator, National Science Foundation, International Research Fellowship Program 2004, Supplementary award.
• “Functional Diversity of Leaf Characteristics along an Environmental Gradient in Tropical Forest”. Environmental Protection Agency, Science to Achieve Results (STAR) Graduate Fellowship 2000-2003.

• Smithsonian Tropical Research Institute Short-Term Fellowship 2000.

• Florida-Georgia Alliance Graduate Fellowship 1998-1999.

• Mellon Foundation Grant for Comparative Research between La Selva and BCI 1997.

Editorial and Professional Positions

• Editorial Board, Journal of Sustainable Forestry (2010 – present)
• Founding Editor, Prometheus Wiki (2009 – present)
• Editorial Review Board, Tree Physiology (2008 – present)


• Referee and panelist for faculty grants, postdoctoral grants, and dissertation research proposals, University of California Institute for Mexico and the United States (UC Mexus) 2008, 2013.

• Referee for 1 proposal, National Fund for Scientific & Technological Development (FONDECYT), Chile, 2009.

• External Reviewer, Xishuangbanna Tropical Botanical Garden, China, 2010.

• Referee and panelist for 5 proposals for the Mildred E. Mathias Graduate Student Research Grant Competition, University of California, 2011.

Peer-Reviewed Publications (65 total)


Gorai M, Laajili W, Santiago LS, Neffati M (2015) Rapid recovery of photosynthesis and water relations following soil drying and re-watering is related to the adaptation of desert shrub Ephedra alata subsp. alenda (Ephedraceae) to arid environments. Environmental and Experimental Botany 109:113-121


Schreeg LA, Santiago LS, Wright SJ, Turner BL (in press) Stem, root and older leaf N:P ratios are more responsive indicators of soil nutrient availability than new foliage. Ecology


Dickens SJM, Allen EB, **Santiago LS**, Crowley D (2013) Exotic annuals reduce soil heterogeneity in coastal sage scrub soil chemical and biological characteristics. *Soil Biology and Biochemistry* 58:70-81


Web of Knowledge Core-Collection Statistics (19 August 2016)

- Sum of the Times Cited: 2281
- h-index: 21

Edited Book and Contributed Chapters


Coverage by Popular Press

“What Does a Dying Forest Sound Like?” Smithsonian.com, 21 April 2016

“Botanist to study responses of trees, shrubs to extreme drought” UC News, 23 September 2015

“Programa busca incentivar estudio de agricultura” La Prensa, Riverside, 12 May 2011

“Fall colors in ... Riverside? Stop your snickering” Los Angeles Times, 16 December 2010


“UC Riverside Botanist to Study Role of Plants in Southern California Drought” The Water Cooler: California’s Water Blog, 11 September 2008

“Decomposition of Leaves Related to Global Warming” Inside UCR, 18 July 2007, p. 3
Presentations at Professional Meetings (76 total)


Ávila-Lovera E, Tezara W, Herrera A, Ezcurra E, **Santiago LS** (2016) Do photosynthetic stems have higher water use efficiency than leaves? Implications for drought responses of tropical and subtropical plants. Association for Tropical Biology and Conservation, Montpellier, France

Goldstein G, **Santiago LS**, Campanello PI, Avalos G, Zhang YJ, Villagra M (2016) Facing shortage of excessive light: how tropical and subtropical trees adjust their photosynthetic behavior and life history traits to a dynamic forest environment. Association for Tropical Biology and Conservation, Montpellier, France

Torres M, Ávila-Lovera E, De Guzman ME, Torres L, **Santiago LS** (2016) Drought resistance of tropical relict species in subtropical arid shrublands of southern California. Association for Tropical Biology and Conservation, Montpellier, France


Acosta-Rangel A, Lovatt C, **Santiago LS** (2016) Functional responses of Avocado trees to environmental stress. Association for Tropical Biology and Conservation, Montpellier, France


**Santiago LS** (2016) Managing Tropical Biodiversity for Watershed Yield: Approaches, Challenges and Policy Implications, Rosenberg International Forum on Water Policy, Panama City, Panama

Acosta-Rangel A, Lovatt CJ, **Santiago LS** (2015) Efecto del estrés abiótico en la floración del aguacate. VIII Congreso Colombiano de Botánica, Manizales, Colombia


Pivovaroff A, Santiago LS (2013) Functional traits better correlate with wet season than dry season water potentials in a Californian chaparral plant community. Ecological Society of America, Minneapolis, Minnesota


Santiago LS, Alstad, KP, de Guzman ME, Pasquini SC, Pivovaroff AL (2011), Consequences of drought-induced vegetation change for water cycling along a desert-shrubland gradient, International Mediterranean Ecosystems Conference (MEDECOS), Los Angeles, California

Pasquini SC, Wright SJ, **Santiago LS** (2011) Are lianas physiologically and morphologically different from trees at the seedling stage? An evaluation using a long-term nutrient enrichment study, Ecological Society of America, Austin, Texas

Pivovaroff, AL, **Santiago LS** (2011) Decoupled stem and leaf hydraulic conductance in California chaparral and coastal sage scrub plant species, Ecological Society of America, Austin, Texas


Dickens SJ, Allen EB, **Santiago LS**, Crowley DE (2011) Environment is a stronger determinant of exotic plant feedbacks to soil than vegetation type in southern California ecosystems, Ecological Society of America, Austin, Texas


Nicotra AB, Cornwell W, Sack L, **Santiago LS** (2010) PrometheusWiki: PROtocols, METHods, explanations and updated standards for ecological and environmental plant physiology, Botanical Society of America, Providence, Rhode Island


Cervera JC, Santiago LS (2010) Predicting shifts in distribution of sympatric cacti from southeastern California: Physiological responses and productivity of crassulacean acid metabolism species to climate change may help explain changes in distribution ranges, Workshop on Crassulacean Acid Metabolism, Panama City, Panama


Dickens SJ, Allen EB, Santiago LS (2009) Soil responses following exotic plant invasion and restoration of coastal sage scrub of Southern California, Ecological Society of America, Albuquerque, New Mexico

Dickens SJ, Allen EB, Santiago LS (2009) Above and belowground feedbacks following exotic plant invasion and restoration of coastal sage scrub of southern California, California Native Plant Society, Sacramento, California


Cervera Herrera JC, **Santiago LS** (2008) Predictions of the productivity of CAM plants in response to climate change in southern California, Mexican Scientific Society of Ecology (SCME), Merida, Mexico

Ricalde Pérez MF, Simá Gómez L, Andrade Torres JL, Durán García R, **Santiago LS** (2008) Seasonal patterns and extent of CAM activity in plants from two ecosystems of the Yucatan Peninsula along an aridity gradient, Mexican Scientific Society of Ecology (SCME), Merida, Mexico


Salzman LK, Allen MF, **Santiago LS** (2008) Using leaf-level gas exchange and soil flux to estimate the carbon exchange in a mixed conifer and hardwood forest, Ecological Society of America, Milwaukee, Wisconsin

Dickens SJM, Allen EB, **Santiago L** (2008) Above and belowground feedbacks following exotic plant invasion and restoration of coastal sage scrub of Southern California, Southern California Academy of Sciences, Dominguez Hills, California


**Santiago LS** (2007) High rates of total N fixation in a tropical dry forest, Ecological Society of America, San Jose, California

Simonin KA, **Santiago LS**, Dawson TE (2007) Canopy wetness decouples plants from soil water deficit, Ecological Society of America, San Jose, California
Santiago LS (2007) Drought tolerance strategies of tropical forest plants from contrasting habitats, Association for Tropical Biology and Conservation, Morelia, Mexico


Santiago LS, Dawson, TE (2006) Photosynthetic light-use efficiency of California redwood forest understory plants along a moisture gradient, Botanical Society of America, Chico, California


Santiago LS (2005) Ecophysiological correlates of plant mortality rates in a wet tropical forest, Center for Tropical Forest Science Symposium, Panama City, Panama

Santiago LS, Quintal-Tun F, Andrade JL, Dawson TE (2005) Dominance of legumes in the Neotropics: Symbiotic nitrogen fixation contributes to high photosynthetic rates, Ecological Society of America, Montreal, Quebec, Canada

Meinzer FC, Goldstein G, Bucci SJ, James S, Santiago LS, Scholz FG (2005) Functional convergence in tropical forest canopy physiology, Ecological Society of America, Montreal, Quebec, Canada


Santiago LS, Dawson TE (2004) The contribution of symbiotically-fixed nitrogen to nitrogen cycling in a deciduous forest in the Yucatan, Mexican Botanical Congress, Oaxaca, Mexico


Santiago LS (2002) Leaf photosynthesis and chemistry predict leaf decomposition rate in the lowland wet forest of Fort Sherman, Panama. Association for Tropical Biology, Panama City, Panama

Santiago LS, Mulkey SS (2002) Productivity along a precipitation gradient in lowland Panama: patterns from leaf to ecosystem. Association for Tropical Biology, Panama City, Panama

Santiago LS (2001) Photosynthetic capacity and associated leaf traits along a precipitation gradient in lowland tropical forest. Ecological Society of America, Madison, Wisconsin


Invited Seminars

Occidental College, Los Angeles, October 2015
Universidad de los Andes, Bogota, Colombia, (given in Spanish) April 2015
Los Alamos National Laboratory, New Mexico, June 2014
Smithsonian Tropical Research Institute, Tupper Seminar, September 2012
University of California, Los Angeles, January 2012
Curriculum vitae

Rancho Santa Ana Botanic Garden, Claremont, November 2011
Hewett Lecture, Earth Sciences, UCR, November 2011
Guangdong Academy of Forestry, Guangzhou, China, September 2011
Chinese Academy of Sciences, Guangzhou, China, August 2011
Botany and Plant Sciences Department, April 2011
Evolution, Ecology and Organismal Biology Graduate Program, UCR, March 2011
Botany and Entomology Undergraduate Student Association, UCR, Riverside, March 2011
Guangdong Academy of Forestry, Guangzhou, China, September 2010
University of California, San Diego, January 2010
Statistics Department, UCR, Riverside, January 2010
Whittier College, November 2009
Barro Colorado Island, Smithsonian Tropical Research Institute, Panama, August 2008
California State University, Fullerton, April 2008
Department of Biology, UCR, February 2008
Botany and Entomology Undergraduate Student Association, UCR, Riverside, June 2008
Embassy of France, Washington, DC, October 2007
University of California, Irvine, June 2007
California State University, San Jose, April 2007
Lunch Bunch, UCR, November 2006
Macquarie University, Sydney, Australia, November 2006
California State University, San Bernardino, October 2006
California State University, Humboldt, March 2006
National Autonomous University of Mexico, Morelia, Mexico (given in Spanish), January 2006
Ecolunch, University of California, Berkeley, March 2005
Center for Scientific Study of the Yucatan (CICY), (given in Spanish) February 2004
Botany Department, University of Florida, April 2003
Ecophysiology Group, University of Miami, July 2002
Ecolunch, University of Florida, November 2001
Barro Colorado Island, Smithsonian Tropical Research Institute, Panama, November 2000
Center for Scientific Study of the Yucatan (CICY), (given in Spanish) July 2000
Tupper Seminar, Smithsonian Tropical Research Institute, Panama, July 1999
Tropi-Lunch, University of Florida, August 1998
Department of Botany, University of Panama, (given in Spanish) July 1998
Hawaiian Botanical Society, Honolulu, Hawai, September 1997
Hawaiian Botanical Society, Honolulu, Hawaii, December 1996

Service to the University of California, Riverside

Service to the Department of Botany and Plant Sciences

• Undergraduate Advisor (2011 – present)
• Member, Graduate Education Advisory Committee (2008 – 2011)
Service to the Evolution, Ecology and Organismal Biology Graduate Program
• Member, Executive Committee (2008 – 2013)
• Member, Committee for Graduate Admissions (2008 – 2013)

Service to the College of Natural and Agricultural Sciences
• Member, Job Search Committee, Director of EDGE Institute (2016)
• Member, Job Search Committee, Director of Center for Conservation Biology (2016)
• Member, Steering Committee for the Center for Conservation Biology (2010 – present)
• Co-director, Facility for Isotope Ratio Mass Spectrometry (2008 – present)

Service to the University of California, Riverside Campus and the UC System
• Member, Job Search Committee, Citrus Agricultural Economist (2016)
• Member, Job Search Committee, Dean of School of Public Policy (2013)
• Faculty Team Member, Site Evaluator for UC Natural Reserve System (2010)
• Member, Job Search Committee, Director of UC Mexus (2008)
• Member, Chancellor’s Postdoctoral Fellowship Selection Committee (2007, 2008)
• Co-organizer, UCR-ECOSUR-Mexico Symposium (2007)
• Panelist, Graduate Diversity Summit (2007)

Teaching
• Botany and Plant Sciences 166/243, Plant Physiological Ecology (2007 – present)
• Botany and Plant Sciences 143, Plant Physiology (2013, 2016)
• Botany and Plant Sciences 240, Current Topics, Graduate Seminar (2008, 2010)

Advising and Mentoring
• Major professor for 3 current PhD students, 1 graduated in 2015
• Qualifying Exam Committee member for 45 students (2006 – 2016)
• PhD Dissertation Committee member for 21 students (2006 – 2016)
• External/International PhD Dissertation Committee member/mentor for 7 students
• Mentor for >20 UCR undergraduate students (2006 – present)

Professional Affiliations

American Geophysical Union
Association for Tropical Biology and Conservation
Ecological Society of America
Society for Tropical Ecology (gtö)
NAME: Song, Jikui  
(Last, First, Middle)

POSITION TITLE: Assistant Professor of Biochemistry

CURRENT INSTITUTIONAL ADDRESS:
5485 Boyce Hall
Department of Biochemistry
University of California, Riverside
Riverside, CA 92521

Email Address: jikui.song@ucr.edu

Phone Number: 951-827-4221

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

<table>
<thead>
<tr>
<th>INSTITUTION AND LOCATION</th>
<th>DEGREE (if applicable)</th>
<th>YEAR(S)</th>
<th>FIELD OF STUDY</th>
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<tbody>
<tr>
<td>University of Science and Technology of China, Hefei, Anhui</td>
<td>BS</td>
<td>07/1994</td>
<td>Chemical Physics</td>
</tr>
<tr>
<td>Institute of Biophysics, Chinese Academy of Sciences, Beijing</td>
<td>MS</td>
<td>07/1997</td>
<td>Molecular Biology</td>
</tr>
<tr>
<td>University of Wisconsin, Madison, WI</td>
<td>MS</td>
<td>12/2001</td>
<td>Computer Sciences</td>
</tr>
<tr>
<td>University of Wisconsin, Madison, WI</td>
<td>PHD</td>
<td>12/2002</td>
<td>Biochemistry</td>
</tr>
<tr>
<td>Memorial Sloan-Kettering Cancer Center, New York, NY</td>
<td>Postdoctoral</td>
<td>12/2011</td>
<td>Structural Biology and</td>
</tr>
<tr>
<td></td>
<td>Fellow</td>
<td></td>
<td>Epigenetics</td>
</tr>
</tbody>
</table>

NOTE: NO PAGE LIMITATIONS

A. Positions and Honors
   List in chronological order previous positions, concluding with the present position. List any honors.

   **Positions and Employment**
   
   2002 - 2007    Assistant Researcher, Center for Eukaryotic Structural Genomics, University of Wisconsin, Madison, WI
   2007 - 2011    Research Associate/Senior Research Scientist, Memorial Sloan-Kettering Cancer Center, New York, NY
   2012 -         Assistant Professor, Department of Biochemistry, University of California, Riverside, CA

   **Other Experience and Professional Memberships**
   
   Biophysical Society (2015-)
   Protein Science Society (2016-)

   **Honors**
   
   2013    Basil O'Connor Starter Scholar Research Award, March of Dimes Foundation
   2013    Robert T. Poe Faculty Development Grant, Chinese American Faculty Association of Southern California
   2013    Regents' Faculty Fellowship, University of California, Riverside
   2014    Hellman Fellowship, Hellman Family Foundation
   2015    Kimmel Scholar Award, Sidney Kimmel Foundation for Cancer Research

B. Peer-reviewed Publications
   List publications by career stages in chronological order.
   ["Equally Contributing Authors; "Corresponding author(s)]

   **Graduate school and earlier publications**


4. Song J, Laskowski M Jr, Qasim MA, Markley JL. NMR determination of pKa values for Asp, Glu, His, and Lys mutants at each variable contiguous enzyme-inhibitor contact position of the turkey ovomucoid third domain. Biochemistry. 2003; 42(10):2847-56. PMID: 12627950


Post-doctoral publications


12. Zhao Q, Song J, Jin Z, Danilova V, Hellekant G, Markley JL. Probing the sweet determinants of brazzein: wild-type brazzein and a tasteless variant, brazzein-Ins(R18a-I18b), exhibit different pH-dependent NMR chemical shifts. Biochemical and biophysical research communications. 2005; 335(1):256-63. PMID: 16105551


**Assistant professor publications**


**C. Research Support**

List ongoing and completed research projects (Federal or non-Federally supported). Begin with the projects that are most relevant to the research proposed in the application. Briefly indicate the overall goals of the projects and responsibilities of the key person identified on the Biographical Sketch.

**Ongoing Research Support**

8/1/2016 – 7/31/2021
1R35GM119721
NIH/MIGMS
Mechanistic Insights into Mammalian DNA Methylation
The major goals of this project are to investigate the mechanistic basis of mammalian DNA methylation. Role: PI

6/1/2015 – 5/31/2018
#1-FY15-345
Structural insights into the origin recognition complex and Meier-Gorlin syndrome, March of Dimes Song, Jikui (PI)
The major goals of this project are to investigate how impairment of chromatin loading or molecular assembly of origin recognition complex plays an etiologic role in Meier-Gorlin syndrome pathogenesis. Role: PI

7/1/2015 – 6/30/2017
Kimmel Scholar Award
Sidney Kimmel Foundation for Cancer Research
Song, Jikui (PI)
Structure and mechanism of mammalian DNA methylation machineries in health and cancer
The major goal of this project is to study the regulatory mechanisms of DNMT1 and DNMT3A. Role: PI

Completed Research Support

3/1/2013 – 2/28/2015
#1-FY13-29
Structural insights into the origin recognition complex and Meier-Gorlin syndrome, March of Dimes
Song, Jikui (PI)
The major goal of this project is to define structural principles of chromatin association and architectural assembly of Origin Recognition Complex and their functional implications in Meier-Gorlin Syndrome. Role: PI

7/1/2015 – 6/30/2016
CRC-15-380558
UC Cancer Research Coordinating Committee
Inhibition of the EBNA2-mediated transcription activation by BS69: structure and mechanism
Song, Jikui (PI)
The major goals of this project are to provide the molecular basis for the specific BS69-EBNA2 recognition, and to identify how the BS69-EBNA2 interaction affects the transactivation potential of EBNA2. Role: PI
Curriculum vitae

Yinsheng Wang

Vital Statistics:
Year of Birth: 1971; Place of Birth: Anhui, China
Married, 1996. Two children, Michael and Michelle.

Business Address:
Department of Chemistry-027, University of California at Riverside, Riverside, CA 92521-0403.
E-mail: Yinsheng.Wang@ucr.edu. Telephone: (951)827-2700. Fax: (951)827-4713.

Home Address:
8371 Manhasset Street, Riverside, CA 92508. Telephone: (951)653-5106.

Education & Positions:
B. S. 1989-1993, Shandong University, China;
M. S. 1993-1996, Dalian Institute of Chemical Physics, Chinese Academy of Sciences (Advisor: Professor Runsheng Zhai);
Ph. D. 1997-2001, Department of Chemistry, Washington University in St. Louis (Advisors: Professors Michael L. Gross and John-Stephen A. Taylor);
Assistant Professor in Chemistry, 2001-2005, University of California Riverside;
Associate Professor in Chemistry, 2005-2008, University of California Riverside;
Professor in Chemistry, 2008-present, University of California Riverside;
Donald T. Sawyer Endowed Founder's Chair in Chemistry, 2016-present, University of California Riverside;
Director, Environmental Toxicology Graduate Program, 2008-present, University of California Riverside

Courses Taught:
CHEM 1A: General Chemistry (2003, 2004)
CHEM 1HB: Honors General Chemistry (2007-2010)
CHEM 221B: Advanced Analytical Chemistry: Optical Spectroscopy (2005-2013)

Activities with Professional Societies:
American Chemical Society
American Society for Mass Spectrometry
American Association for the Advancement of Sciences
Treasurer-Elect, Division of Chemical Toxicology, American Chemical Society (11/2011-10/2013)
Treasurer, Division of Chemical Toxicology, American Chemical Society (11/2013-present)
## List of Contract and Grant Support:

<table>
<thead>
<tr>
<th>Agency</th>
<th>Title</th>
<th>Dates</th>
<th>Amount</th>
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<tr>
<td>NIH (completed, R01 CA 96906)</td>
<td>ROS-induced Nucleic Acid Damage</td>
<td>07/01/02-06/30/07</td>
<td>$894,917</td>
<td>PI</td>
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<td>ASMS (Completed, 2005 Research Award)</td>
<td>Pinpointing the Nature of Glycosylation in HMGN2 Protein</td>
<td>07/01/05-06/30/06</td>
<td>$25,000</td>
<td>PI</td>
</tr>
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<td>Ceres Corporation (Completed)</td>
<td>DNA Damage Induced by Psoralen and its Analogs</td>
<td>07/01/06-06/30/08</td>
<td>$178,374</td>
<td>PI</td>
</tr>
<tr>
<td>JDRF (completed)</td>
<td>Methylglyoxal-modified Hemoglobin as Biomarkers for Diabetic Nephropathy</td>
<td>07/01/07-06/30/08</td>
<td>$110,000</td>
<td>PI</td>
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<tr>
<td>NIH (completed, R01 CA101864)</td>
<td>Oxidative Crosslink Lesions and CpG Mutagenesis</td>
<td>07/01/04-04/30/09</td>
<td>$1,169,626</td>
<td>PI</td>
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<tr>
<td>NIH (completed, R56 CA96906-06)</td>
<td>ROS-induced Nucleic Acid Damage</td>
<td>09/30/09-09/29/10</td>
<td>$181,544</td>
<td>PI</td>
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<tr>
<td>NIH (completed, R01 CA116522)</td>
<td>Post-translational Modifications of High-mobility Group proteins</td>
<td>08/01/07-07/31/10</td>
<td>$910,066</td>
<td>PI</td>
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<tr>
<td>NIH (completed, R01 DK082779, Diversity Supp.)</td>
<td>Chemistry and Biology of DNA Carboxyalkylation</td>
<td>07/01/09-06/30/11</td>
<td>$125,758</td>
<td>PI</td>
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<tr>
<td>NIH (completed, R01 DK082779, Equipment Supp.)</td>
<td>Chemistry and Biology of DNA Carboxyalkylation</td>
<td>07/01/09-03/31/11</td>
<td>$99,505</td>
<td>PI</td>
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<tr>
<td>TRDRP (completed, 18XT-0073)</td>
<td>DNA Adducts Arising from Tobacco-derived N-nitrosamines</td>
<td>07/01/09-06/30/11</td>
<td>$250,000</td>
<td>PI</td>
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<tr>
<td>NIH (Completed, S10 RR022331)</td>
<td>A TSQ Vantage Mass Spectrometer for the ACIF</td>
<td>05/06/10-05/05/11</td>
<td>$469,334</td>
<td>PI</td>
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<tr>
<td>NIH (Completed, P01 GM068087)</td>
<td>Functional Analysis and Systems Biology of Filamentous Fungi</td>
<td>04/01/09-03/31/14</td>
<td>$100,545 (to Wang)</td>
<td>Subcontract (PI, Dunlap)</td>
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<tr>
<td>NIH (Completed, R01 DK082779)</td>
<td>Chemistry and Biology of DNA Carboxyalkylation</td>
<td>07/01/09-06/30/14</td>
<td>$1,702,660</td>
<td>PI</td>
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<tr>
<td>NIH (Completed, S10 OD010669-01)</td>
<td>An LTQ-Orbitrap Elite with ETD for the Keck Proteomics Facility</td>
<td>06/01/13-05/31/14</td>
<td>$600,000</td>
<td>PI</td>
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<tr>
<td>NIH (Completed, T32 ES018827)</td>
<td>Research Training in Environmental Toxicology</td>
<td>07/01/10-06/30/15</td>
<td>$1,091,527</td>
<td>PI</td>
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<tr>
<td>NIH (Completed, R13 ES024658)</td>
<td>Mechanisms and Biomarkers of Environmental Stress</td>
<td>07/01/14-06/30/15</td>
<td>$6,000</td>
<td>PI</td>
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<tr>
<td>NIH (Active, R01 CA101864)</td>
<td>Oxidative DNA Damage and CpG Mutagenesis</td>
<td>07/01/04-02/29/16</td>
<td>$1,181,815</td>
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<td>NIH (Active, R01 ES019873)</td>
<td>Repair of Radiation-Induced Crosslink Lesions of DNA</td>
<td>05/01/12-01/31/17</td>
<td>$1,539,000</td>
<td>PI</td>
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<td>NIH (Active, R01 ES021007)</td>
<td>Cross-links at Abasic Sites in Duplex DNA</td>
<td>08/15/12-04/30/17</td>
<td>$1,612,016 ($646,000 to Wang)</td>
<td>Multi-PI (Gates and Wang)</td>
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<td>NIH (Active, P01 AG043376)</td>
<td>Cell Autonomous and Non-Autonomous Mechanisms of Aging</td>
<td>07/01/13-06/30/18</td>
<td>$10,618,577 ($731,743 to Wang)</td>
<td>Co-Investigator (PI: Paul Robbins)</td>
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<tr>
<td>NIH (Active, R01 DK082779)</td>
<td>Chemistry and Biology of DNA Carboxyalkylation</td>
<td>07/01/14-06/30/17</td>
<td>$991,800</td>
<td>PI</td>
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<tr>
<td>NIH (Active, R01 ES025121)</td>
<td>Repair and Biological Consequences of Alkylated Thymidine Lesions</td>
<td>11/01/14-10/31/19</td>
<td>$1,710,000</td>
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<td>NIH (Active, T32 ES018827)</td>
<td>Research Training in Environmental Toxicology</td>
<td>07/01/15-06/30/20</td>
<td>$1,303,687</td>
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<td>NIH (Active, R21 ES025392)</td>
<td>Enzymatic Conversions of Tet-mediated Oxidation Products of 5-Methylcytosine</td>
<td>07/01/15-06/30/17</td>
<td>$418,000</td>
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<td>NIH (Active, R13 ES026043)</td>
<td>New Developments in Assessing Environmental Exposure and Environmental Mutagenesis</td>
<td>07/01/15-06/30/16</td>
<td>$10,000</td>
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<td>NIH (Pending, R01 ES027215-01)</td>
<td>Molecular Mechanisms of Arsenic Carcinogenesis</td>
<td>07/01/16-06/30/21</td>
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<td>NIH (Pending, R01 CA210445-01)</td>
<td>Occurrence and Biological Consequences of Epimeric 2-Deoxyribose Lesions</td>
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<td>NIH (Pending, R01 CA210445-01)</td>
<td>Quantitative Adductomics Approaches for Assessing the Occurrence and Repair of DNA Adducts</td>
<td>07/01/16-06/30/21</td>
<td>$1,941,250</td>
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**Awards:**

2013 Biemann Medal, for “innovative application of mass spectrometry in the field of modified nucleic acids”, the American Society for Mass Spectrometry

2012 Inaugural *Chemical Research in Toxicology* Young Investigator Award, for “applying innovative chemical technologies to the solution of important toxicological problems”, co-sponsored by the Division of Chemical Toxicology of American Chemical Society and the ACS journal *Chemical Research in Toxicology*

2012 Fellow, American Association for the Advancement of Sciences (2012-present), for “distinguished contributions to the field of bioanalytical chemistry, particularly in the development of novel analytical methods enabling understanding of the biological consequences of DNA damage”

2005 Research Award, the American Society for Mass Spectrometry

1996 President Scholarship of Chinese Academy of Sciences
**Campus Services:**
Graduate Studies Committee, Department of Chemistry, University of California at Riverside (2002-2007);
Curricula and Student Affairs Committee, Environmental Toxicology Graduate Program, University of California at Riverside (2002-2010)
Seminar Committee: Environmental Toxicology Graduate Program, University of California at Riverside (Chair, 2004-2006; member 2006-present); Cellular, Molecular and Developmental Biology Graduate Program (member, 2008-2009).
Faculty Search Committee: Junior Physical Chemistry (member, 2003); Junior Analytical Chemistry (member, 2004); Junior Analytical Chemistry (chair, 2005 & 2008); Junior Organic Chemistry (member, 2006); Junior Epigenetics (member, 2012, 2013); Junior Analytical Chemistry (chair, 2014); Vice Provost for International Affairs (member, 2014).
Search Committee, Academic Administrator for the UCR Institute of Integrated Genome Biology, 2007.
Committee on Committees, Academic Senate, UC Riverside, 2010-2013.
Director, interdepartmental graduate program in Environmental Toxicology, 2008-present.
Faculty Director, Analytical Chemistry Instrumentation Facility, 2010-2014.

**Reviewer of Journals:**

**Other Advisory Experience:**
12/06/02-12/07/02 National Research Program for Genomic Medicine of the National Science Council (Taiwan) and the Program Project on Genomics and Proteomics of Academia Sinica.
3/8/06-3/10/06 NIH Post-doctoral Fellowship Panel on Chemical and Bioanalytical Sciences
11/19/08-11/20/08 NIH Panel on Shared Instrumentation Program
06/08/10-06/09/10 NIH/NIEHS Nanotoxicology Special Emphasis Panel (ZES1 SET-V 03)
06/14/10-06/15/10 NIH Cancer Etiology Study Section
07/22/10 NIH Special Emphasis Panel on Fellowship (ZRG1 F04B-B 20 L)
02/28/11-02/28/11 NIH Cancer Etiology Study Section
11/09/11-11/10/11 NIH Environmental Health Sciences Review Committee
02/28/13-03/01/13 Member, NCI P01 Special Emphasis Panel IV
08/14/14-08/15/14 NIEHS Review Committee for the P30 Centers Program
09/10/14-09/11/14 NIH S10 Shared Instrumentation Grant Panel ZRG1 BMCB-D (30)
11/14/14 NIEHS Special Emphasis Panel on K99 grants
07/11-06/15 Member: NIH Cancer Etiology Study Section
11/09/15-11/10/15 NIEHS Special Emphasis Panel on U01 grants

Symposium Organization:
Organizer, symposium on “Mass Spectrometry for the Analysis of DNA Adducts”, 55th ASMS (June 3-7, 2007), Indianapolis, IN.
Organizer, symposium on “Mass Spectrometry for the Analysis of DNA and Protein Damage”, 234th ACS National Meeting (August 19-23, 2007), Boston, MA.
Organizer, “UCR symposium on Tobacco-related Disease Research” (September 25, 2009), Riverside, CA.
Co-Organizer, “UCR symposium on Tobacco-related Disease Research” (October 28, 2010), Riverside, CA.
Organizer, “Applications of Mass Spectrometry in Environmental Toxicology Research”, Pittcon 2011 (March 13-17, 2011), Atlanta, GA.
Organizer, “Chemical Research in Toxicology Award Symposium”, 244th ACS National Meeting, August 19-23, 2012, Philadelphia, PA.
Organizer, “Chemistry and Biology of Metal Toxicity”, 246th ACS National Meeting, September 8-12, 2013, Indianapolis, IN.

Publications:
Refereed Journals:
Affiliation: Dalian Institute of Chemical Physics, Chinese Academy of Sciences


**Affiliation: Washington University in St. Louis**


**Affiliation: University of California at Riverside**


(49) Gao, Y. and Wang, Y.* Site-selective modifications of arginine residues in human hemoglobin induced by methylglyoxal. Biochemistry, 2006, 45, 15654-15660.


(64) Hong, H.; Cao, H. and Wang, Y.* Formation and genotoxicity of a guanine-cytosine intrastrand cross-link lesion in vivo. *Nucleic Acids Res.*, 2007, 35, 7118-7127.

(65) Zhang, Q. and Wang, Y.* Homeodomain-interacting protein kinase-2 (HIPK2) phosphorylates HMGA1a at Ser-35, Thr-52, and Thr-77 and modulates its DNA binding affinity. *J. Proteome Res.*, 2007, 6, 4711-4719.


(81) Xiong, L.; Ping, L.; Yuan, B. and Wang, Y.* Methyl group migration during the fragmentation of singly charged ions of trimethyllysine-containing peptides: Precaution of


**Non-peer-reviewed Book Chapters:**

*Affiliation: Washington University in St. Louis*

Affiliation: University of California at Riverside:


Seminars Given at Universities:

1) “Mass spectrometry for the study of oxidative DNA damage”, Department of Chemistry and Biochemistry, California State University, Fullerton, Sep. 19, 2002.

2) “DNA damage induced by oxidative stress or UV irradiation --- A mass spectrometry approach”, The City of Hope, Sep. 23, 2002.

3) “Top-down and bottom-up approaches for the study of oxidative DNA damage by mass spectrometry”, Department of Chemistry, California State University, San Bernardino, Oct. 31, 2002.


7) “Identification of novel intrastrand crosslink lesions of DNA induced by ionizing radiation and oxidative stress”, Division of Basic Sciences, School of Medicine, Loma Linda University, Oct. 16, 2003.


14) “Chemistry and biology of novel oxidative crosslink lesions of DNA”, Department of Chemistry and Biochemistry, California State University Los Angeles, Nov. 09, 2004.
16) “Chemistry and biology of novel oxidative crosslink lesions of DNA”, Department of Chemistry and Biochemistry, the University of Oklahoma, Apr. 5, 2005.
18) “Chemistry and biology of novel oxidative intrastrand crosslink lesions of DNA”, Department of Chemistry, Graduate School of Science, Kyoto University, Japan, Oct. 20, 2006.
19) “Mass spectrometry for the study of oxidative DNA damage”, Center for Eco-Environmental Sciences, Chinese Academy of Sciences, China, Oct. 22, 2006.
22) “Chemistry and biology of novel oxidative intrastrand crosslink lesions of DNA”, Department of Chemistry, Texas A&M University, May 1, 2007.
23) “Chemistry and biology of novel oxidative intrastrand crosslink lesions of DNA”, Department of Chemistry and Biochemistry, University of Texas at Austin, May 3, 2007.
28) “Oxidative Intrastrand Crosslink Lesions: From Speculation to Reality”, Department of Chemistry and Biochemistry, University of Missouri, St. Louis, December 5, 2007.
31) “Chemistry and Biology of DNA Damage Induced by Reactive Oxygen and Reactive Carbonyl Species”, Department of Chemistry, Johns Hopkins University, April 29, 2008.
32) “Chemistry and Biology of DNA Damage Induced by Reactive Oxygen and Reactive Carbonyl Species”, Distinguished Lecture Series, Department of Chemistry, Hong Kong Baptist University, May 20, 2008.

34) “Chemistry and Biology of DNA Damage Induced by Reactive Oxygen and Reactive Carbonyl Species”, Department of Chemistry, University of Connecticut, October 08, 2008.

35) “Chemistry and Biology of DNA Damage Induced by Reactive Oxygen and Reactive Carbonyl Species”, Department of Chemistry and Biochemistry, University of Ohio, November 10, 2008.

36) “Mass Spectrometry for the Examination of Oxidative Intrastrand Crosslink Lesions of DNA: Structure Elucidation, Quantification and Replication Studies”, Department of Chemistry, Wuhan University, China, August 02, 2010.


38) “LC-MS/MS for Assessing the Replication of Hyperglycemia-induced DNA Lesions in Cells”, College of Chemistry and Molecular Engineering, Peking University, China, August 12, 2010.


41) “Chemistry and Biology of Oxidatively Induced DNA Lesions”, Department of Chemistry and Biochemistry, University of Delaware, November 1, 2010.


44) “Mass spectrometry for the quantification, replication, transcription, and repair studies of bulky DNA lesions induced by reactive oxygen species”, Department of Chemistry, University of California Davis, March 29, 2011.

45) “Detection and in-vivo replication and repair studies of bulky DNA lesions induced by reactive oxygen species”, Department of Chemistry, University of the Pacific, March 30, 2011.

46) “Chemistry and Biology of DNA Carboxyalkylation”, Department of Chemistry, Zhejiang University, China, April 14, 2011.

47) “Post-translational modifications of acid-soluble proteins”, Department of Chemistry, Nanjing University, China, April 18, 2011.

48) “Chemistry and Biology of Ionizing Radiation-induced Bulky DNA Lesions”, Institute of Technological Biology and Agricultural Engineering, Chinese Academy of Sciences, October 10, 2011.

49) “Mass Spectrometry for the Study of Repair and Transcription Mutagenesis of DNA Lesions”, Wuhan University, China, October 13, 2011.

51) “Chemistry and Biology of DNA Damage Induced by Reactive Oxygen and Carbonyl Species”, Department of Chemistry, Washington University, St. Louis, October 27, 2011.

52) “Mass Spectrometry for the Assessment of the Formation, Replication, Repair and Transcription Mutagenesis of DNA Lesions”, Center for Molecular Toxicology, Vanderbilt University, Nashville, TN, October 28, 2011.

53) “Chemistry and Biology of DNA Damage Induced by Reactive Oxygen Species”, Cedars Sinai Medical Center, Los Angeles, February 16, 2012.

54) “Quantitative Proteomics for Unraveling the Mechanisms of Action of Antitumor Agents”, School of Pharmacy, University of New Mexico, Albuquerque, April 9, 2012.

55) “Chemistry and Biology of Oxidatively Induced Bulky DNA Lesions”, Elkin Lecture, Winship Cancer Institute, Emory University, Atlanta, April 27, 2012.

56) “Chemical Biology of Oxidatively Induced Bulky DNA Lesions”, Department of Biochemistry and Molecular Biology, University of Louisville, Louisville, April 30, 2012.

57) “Quantitative Proteomics for Unraveling the Mechanisms of Action of Antitumor Drugs and Environmental Toxicants”, State Key Laboratory of Marine Environmental Science, Xiamen University, China, June 26, 2012.

58) “Chemical Biology of Oxidatively Induced DNA Lesions”, Department of Biochemistry and Molecular Biology, George Washington University, July 17, 2012.

59) “Chemical Biology of Oxidatively Induced DNA Lesions”, Department of Chemistry, Purdue University, September 4, 2012.

60) “Chemical Biology of Oxidatively Induced Bulky DNA Lesions”, Department of Chemistry and Biochemistry, University of Wisconsin-Milwaukee, September 14, 2012.


62) “Chemistry and Biology of Oxidatively Induced Bulky DNA Lesions”, Department of Chemistry and Biochemistry, University of California, San Diego, March 11, 2013.


67) “Post-translational Regulation of DNA Repair”, Institute of Chemistry, Academic Sinica, Taiwan, October 31, 2013.

68) “Chemical Biology of Oxidatively Induced Bulky DNA Lesions”, Genome Research Center, Academic Sinica, Taiwan, October 31, 2013.
69) “Quantitative Proteomics for the Discovery of Targets for Anti-cancer Therapy”, University of California Davis Cancer Center, November 21, 2013.

70) “Quantitative Proteomics for the Unraveling the Molecular Mechanisms of Action of Anticancer Drugs and Environmental Toxicants”, Department of Chemistry and Biochemistry, University of California Los Angeles, January 17, 2014.


72) “Quantitative Proteomics for the Unraveling the Molecular Mechanisms of Action of Anticancer Drugs and Environmental Toxicants”, High Magnetic Field Laboratory, Chinese Academy of Sciences, April 15, 2014.

73) “Quantitative Proteomics for the Unraveling the Molecular Mechanisms of Action of Anticancer Drugs and Environmental Toxicants”, School of Life Sciences, University of Science and Technology of China, April 16, 2014.

74) “Quantitative Proteomics for the Unraveling the Molecular Mechanisms of Action of Anticancer Drugs and Environmental Toxicants”, School of Medicine, Loma Linda University, May 29, 2014.

75) “Quantitative Proteomics for Research in Cancer Biology and Environmental Toxicology”, Center for Eco-Environmental Sciences, Chinese Academy of Sciences, Beijing, China, June 25, 2014.

76) “Quantitative Proteomics for Proteome-wide Studies of Nucleotide-binding Proteins”, High Magnetic Field Laboratory, Chinese Academy of Sciences, Hefei, China, June 27, 2014.

77) “Quantitative Proteomics for Research in Cancer Biology and Environmental Toxicology”, Department of Biochemistry, University at Buffalo, August 26, 2014.

78) “Chemistry and Biology of DNA Repair”, Medical Research Council Laboratory of Molecular Biology, Cambridge, United Kingdom, September 4, 2014.


81) “Chemistry and Biology of DNA Repair”, Department of Pharmacology and Toxicology, University of Texas Medical Branch at Galveston, November 6, 2014.

82) “Quantitative Proteomics for Research in Cancer Biology and Environmental Toxicology”, Department of Chemistry and Biochemistry, University of Texas Arlington, November 7, 2014.

83) “Chemistry and Biology of DNA Repair”, Department of Environmental Medicine, New York University, December 15, 2014.

84) “Cyclopurine Lesions as Robust Biomarkers of Oxidative Stress”, Department of Medicine, Albert Einstein College of Medicine, December 16, 2014.

85) “Chemistry and Biology of Tet-mediated Oxidation of 5-Methylcytosine”, Department of Chemistry, Wuhan University, China, June 8, 2015.

86) “Chemistry and Biology of DNA Repair”, Department of Chemistry, University of Science and Technology of China, June 9, 2015.
87) “Chemistry and Biology of Oxidatively Induced Bulky DNA Lesions”, Department of Chemistry, Hong Kong University of Science and Technology, June 11, 2015.

88) “Quantitative Proteomics for Assessing the Molecular Mechanisms of Action of Anti-cancer Drugs and Environmental Toxicants”, Department of Applied Biology and Chemical Technology, Hong Kong Polytechnic University, June 12, 2015.

89) “Chemistry and Biology of DNA Repair”, MGH/Harvard Cutaneous Biology Research Center, Massachusetts General Hospital and Harvard School of Medicine, August 17, 2015.


91) “Occurrence, Repair and Biological Consequences of Oxidatively Induced DNA Lesions”, Department of Medicinal Chemistry, University of Toledo, October 1, 2015.

92) “Chemistry and Biology of the Occurrence and Biological Consequences of DNA Damage”, Department of Chemistry and Biochemistry, Wayne State University, October 2, 2015.

93) “Chemistry and Biology of DNA Damage and Repair”, Institute of Biomedical Sciences, Fudan University, October 30, 2015.

94) “Chemistry and Biology of DNA Damage and Repair”, Department of Chemistry, Brown University, November 13, 2015.

95) “Chemistry and Biology of DNA Repair”, School of Pharmacy, University of Arizona, December 15, 2015.

96) “Chemistry and Biology of DNA Repair”, Department of Chemistry and Biochemistry, University of Texas, El Paso, January 29, 2016.

97) “Occurrence, Biological Consequences and Repair of DNA Lesions”, Department of Chemistry, University of South Florida, March 31, 2016.


99) “Occurrence, Repair and Biological Consequences of DNA Damage”, Department of Chemistry, Nanjing University, China, May 23, 2016.

100) “Chemistry and Biological Consequences of DNA Modifications”, Department of Chemistry, Wuhan University, China, May 24, 2016.


102) “Chemistry and Biology of DNA Repair”, Department of Chemistry, Shandong University, China, May 26, 2016.

Invited Oral Presentations Made at Conferences:
Affiliation: University of California at Riverside:

(2) **Wang, Y.; Liu, Z.; and Zhang, Q.** “Top-down” and “bottom-up” approaches for the study of oxidative DNA damage by mass spectrometry. *LabAutomation 2003*, Feb 1-5, 2003, Palm Springs, CA.

(3) **Wang, Y.; Liu, Z.; and Zhang, Q.** Identification and characterization of a novel crosslink lesion in d(CpC). *51th ASMS conference on mass spectrometry and allied topics*, Jun. 8-13, 2003, Montreal, CA.

(4) **Wang, Y.; Zhang, Q.; and Zeng, Y.** Mass spectrometry as a major technique for the discovery of novel oxidative crosslink lesions of DNA. *2004 Lake Arrowhead conference on ion chemistry and mass spectrometry*, Jan. 16-18, 2004, Lake Arrowhead, CA.


(6) **Wang, Y.** Mass spectrometry for the discovery of novel oxidative crosslink lesions of DNA. *228th ACS National Meeting*, San Diego, CA, March 13-17, 2005.

(7) **Wang, Y.** Photocaged radicals for the studies of oxidative DNA damage, *11th Congress of the European Society for Photobiology*, Aix-les-Bains, France, September 3-9, 2005.


(12) **Wang, Y.** Mass spectrometry for the structure elucidation, quantification, and replication studies of oxidative intrastrand crosslink lesions of DNA. *2007 Shanghai Symposium on Biomedical Sciences*, Shanghai, China, Oct. 25, 2007.


(22) Wang, Y. Formation and in-vivo replication studies of bulky DNA lesions induced by reactive oxygen species. *240th ACS National Meeting*, Boston, MA, August 22-26, 2010.


(44) Wang, Y. Occurrence, Biological Consequences and Repair of Oxidatively Induced 8,5'-Cyclopurine Lesions. *Zing Conference on Genomic Integrity*, Cairns, Australia, August 1-5, 2015.


**Trainees:**

*Graduate Students*

<table>
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<tr>
<th>Name</th>
<th>Ph. D.</th>
<th>Time</th>
<th>Current Position</th>
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<tbody>
<tr>
<td>Xinzhuo Jiang</td>
<td>X</td>
<td>09/01-04/06</td>
<td>Senior Manager, Amgen Inc.</td>
</tr>
<tr>
<td>Qibin Zhang</td>
<td>X</td>
<td>03/02-05/05</td>
<td>Associate Professor, UNC Greensboro</td>
</tr>
<tr>
<td>Yuesong Wang</td>
<td>X</td>
<td>09/01-06/06</td>
<td>Chemist, Food and Drug Administration</td>
</tr>
<tr>
<td>Yan Zou</td>
<td>X</td>
<td>08/02-03/07</td>
<td>Manager, Collaboration Projects, iCMC-NPP, Sanofi US</td>
</tr>
<tr>
<td>Yu Zeng</td>
<td>X</td>
<td>08/02-03/07</td>
<td>Scientist, Alnylam Pharmaceuticals</td>
</tr>
<tr>
<td>Chunang Gu</td>
<td>X</td>
<td>08/02-03/07</td>
<td>Scientist, Genentech Inc.</td>
</tr>
<tr>
<td>Lijie Men</td>
<td>X</td>
<td>08/02-03/07</td>
<td>Scientist, Johnson &amp; Johnson</td>
</tr>
<tr>
<td>Yuan Gao</td>
<td>X</td>
<td>05/03-02/08</td>
<td>Scientist, Novo Nordisk, Beijing</td>
</tr>
<tr>
<td>Haizheng Hong</td>
<td>X</td>
<td>08/03-12/07</td>
<td>Associate Professor, Xiamen University</td>
</tr>
<tr>
<td>Qingchun Zhang</td>
<td>X</td>
<td>08/03-02/08</td>
<td>Scientist, Amgen Inc.</td>
</tr>
<tr>
<td>Haibo Qiu</td>
<td>X</td>
<td>08/04-03/09</td>
<td>Scientist, Regeneron Pharmaceuticals Inc.</td>
</tr>
<tr>
<td>Yong Jiang</td>
<td>X</td>
<td>08/04-11/09</td>
<td>Post-doc, Emory University</td>
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<tr>
<td>Mario Vargas</td>
<td>X</td>
<td>08/05-03/12</td>
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<tr>
<td>Hongxia Wang</td>
<td>X</td>
<td>08/05-08/10</td>
<td>Application Chemist, Thermo Fisher Scientific</td>
</tr>
<tr>
<td>Lei Xiong</td>
<td>X</td>
<td>08/06-02/11</td>
<td>Applied Biosystems</td>
</tr>
<tr>
<td>Jianshuang Wang</td>
<td>X</td>
<td>01/08-03/11</td>
<td>Associate Scientist, Genentech Inc.</td>
</tr>
<tr>
<td>Nisana Andersen</td>
<td>X</td>
<td>09/07-09/13</td>
<td>Associate Scientist, Genentech Inc.</td>
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<tr>
<td>Renee Williams</td>
<td>X</td>
<td>09/07-12/12</td>
<td>Johnson &amp; Johnson</td>
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<tr>
<td>Fan Zhang</td>
<td>X</td>
<td>09/08-09/13</td>
<td>Scientist, Amgen Inc.</td>
</tr>
<tr>
<td>Candace Guerrero</td>
<td>X</td>
<td>09/08-06/14</td>
<td>Postdoc, University of Minnesota</td>
</tr>
<tr>
<td>Yongsheng Xiao</td>
<td>X</td>
<td>07/09-03/14</td>
<td>Scientist, Biogen</td>
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29
<table>
<thead>
<tr>
<th>Name</th>
<th>Ph. D.</th>
<th>Time</th>
<th>Current Position</th>
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<tbody>
<tr>
<td>Ashley Swanson</td>
<td>X</td>
<td>08/09-06/14</td>
<td>Postdoc, NIH</td>
</tr>
<tr>
<td>Qian Cai</td>
<td>X</td>
<td>08/09-12/14</td>
<td>Genentech Inc.</td>
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<td>Shuo Liu</td>
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<td>Lei Guo</td>
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<td>Biochemistry and Bioanalytics Group, Translational Science, Sanofi US</td>
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<td>Preston Williams</td>
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<td>Zi Wang</td>
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<td>08/11-08/16</td>
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<td>Yang Yu</td>
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<td>Ji Jiang</td>
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<td>Ming Huang</td>
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<td>Nicole Williams</td>
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<td>Yuxiang Cui</td>
<td>X</td>
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<td>Jiabin Wu</td>
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<tr>
<td>Weili Miao</td>
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<td>Lok Ming Tam</td>
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<td>Gwendolyn Gonzalez</td>
<td>X</td>
<td>06/15-present</td>
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<tr>
<td>David Bade</td>
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**Post-doctoral Fellows**

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<tr>
<td>Shetty Vivekananda</td>
<td>08/01-09/02</td>
<td>Assistant Professor, Baylor College of Medicine</td>
</tr>
<tr>
<td>Zhenjiu Liu</td>
<td>12/01-06/03</td>
<td>Scientist, Pfizer</td>
</tr>
<tr>
<td>Liyan Ping</td>
<td>09/07-02/08</td>
<td>Junior Group Leader at Max Planck Institute of Chemical Ecology</td>
</tr>
<tr>
<td>Huachuan Cao</td>
<td>02/04-12/08</td>
<td>Scientist, Eli Lilly</td>
</tr>
<tr>
<td>Bifeng Yuan</td>
<td>07/07-02/11</td>
<td>Professor of Chemistry, Wuhan University, China</td>
</tr>
<tr>
<td>Jiang Wu</td>
<td>09/09-08/10</td>
<td>Assistant Professor, Nanjing University, China</td>
</tr>
<tr>
<td>Xiaoli Dong</td>
<td>08/09-07/11</td>
<td>Agilent</td>
</tr>
<tr>
<td>Jin Wang</td>
<td>08/09-07/12</td>
<td>Postdoc at National University of Singapore</td>
</tr>
<tr>
<td>Changjun You</td>
<td>10/09-present</td>
<td></td>
</tr>
<tr>
<td>John Prins</td>
<td>08/10-09/13</td>
<td>Analytical Chemist, Tyco International</td>
</tr>
<tr>
<td>Xiaoxia Dai</td>
<td>03/11-present</td>
<td></td>
</tr>
<tr>
<td>Debin Ji</td>
<td>06/12-05/14</td>
<td>Postdoc, Stanford University</td>
</tr>
<tr>
<td>Qianqian Zhai</td>
<td>07/12-09/14</td>
<td>Lecturer, Huazhong Agricultural University, China</td>
</tr>
<tr>
<td>Nicholas Amato</td>
<td>07/13-12/15</td>
<td>Scientist, Moderna Therapeutics</td>
</tr>
<tr>
<td>Tao Bing</td>
<td>03/14-02/15</td>
<td>Associate Professor, Institute of Chemistry, Chinese Academy of Sciences</td>
</tr>
<tr>
<td>Jun Wu</td>
<td>07/14-present</td>
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<tr>
<td>Xiaogang Jiang</td>
<td>12/14-11/15</td>
<td>Associate Professor, Suzhou University</td>
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<tr>
<td>Nathan Price</td>
<td>01/15-present</td>
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<td>Lin Li</td>
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<tr>
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<tr>
<td>Jiapeng Leng</td>
<td>02/16-present</td>
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<td>Tianlu Wang</td>
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<td>Rong Cai</td>
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**Undergraduate Students**

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<tr>
<td>Judith Padilla</td>
<td>08/01-12/01</td>
</tr>
<tr>
<td>Erica Winter</td>
<td>09/01-06/02</td>
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<tr>
<td>Dahn Chi</td>
<td>09/02-06/03</td>
</tr>
<tr>
<td>Kaleb Dixon</td>
<td>09/02-06/03</td>
</tr>
<tr>
<td>Dena Witthaus</td>
<td>03/02-06/03</td>
</tr>
<tr>
<td>Jina Wang</td>
<td>06/03-03/04</td>
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<tr>
<td>Kieu Nguyen</td>
<td>09/03-12/03</td>
</tr>
<tr>
<td>Chelsea Gustafson</td>
<td>06/05-09/05</td>
</tr>
<tr>
<td>Avi Perma</td>
<td>06/05-08/06</td>
</tr>
<tr>
<td>Tan-li Hsu</td>
<td>02/07-06/10</td>
</tr>
<tr>
<td>Andrew Lin</td>
<td>02/07-12/08</td>
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<tr>
<td>Felicia Pranata</td>
<td>02/07-06/09</td>
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<tr>
<td>Karen Zhong</td>
<td>09/11-06/12</td>
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<tr>
<td>Audrey Tu</td>
<td>09/11-06/12</td>
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<tr>
<td>Stephen Torres</td>
<td>03/11-12/11</td>
</tr>
</tbody>
</table>
Charlie Shi 07/11-06/13
Min Xue, Ph.D.
Assistant Professor of Chemistry
Department of Chemistry
University of California, Riverside
900 University Ave. Riverside, CA 92521
Website: http://xuelab.ucr.edu
E-mail: min.xue@ucr.edu

Educational Background

University of California, Los Angeles 2008-2013
Ph.D. in Chemistry, Advisor: Prof. Jeffrey I. Zink

California Institute of Technology 2013-2015
Postdoctoral Scholar, Advisor: Prof. James R. Heath

Personal Statement

My research experience covers a broad spectrum of fields, including supramolecular chemistry, nanoparticle engineering, applied spectroscopy, bioanalytical chemistry, systems biology and nanomedicine. Currently, the premise of my research is to study the supramolecular properties of peptides, and to explore their biomedical applications. Specific research interests are: 1) Designing supramolecular peptides that are capable of binding to specific proteins. The goal is to seek inhibitors for previously undruggable protein targets and establish new therapeutics; 2) Develop functional peptides as the basis of novel bioanalytical methods, and implement these methods to map the dynamics of cell signaling pathways. This will help us to decode the mechanisms behind disease progression and drug resistance; and 3) Constructing nanoparticles for biological applications. This includes, and is not limited to, developing nanoparticles for cancer immunotherapy, cardiovascular disease therapies and bio-imaging probes.

Contributions to Science and Selected Publications

1. Supramolecular Nanovalves for Controlled Release and Chemical Sensing

Upon stimulation, many supramolecular structures undergo large-amplitude motions, such as isomerization, structural reorganization, and components disassociation. When these supramolecular complex are grafted at the opening of nanopores, they are able to control the access to the pore, and therefore control the release of cargo molecules from the pore. This type of structure is termed nanovalve. I have developed several types of stimuli-responsive nanovalves. These nanovalves are shown to be useful building blocks for smart drug delivery systems as well as chemical sensors.


2. Silica-Based Versatile Drug Delivery Platforms

A key challenge for improving the efficacy of passive drug delivery to tumor sites by a nanocarrier is to limit reticuloendothelial system uptake and to maximize the enhanced permeability and retention effect. Traditional silica-based nanoparticles have a size around 120 nm, which often times is too large for effective in vivo drug delivery. With my expertise in nanoparticle synthesis and surface chemical modification, I have developed much smaller silica nanoparticles (30-50 nm) that lead to greatly improved biodistribution profiles and better therapeutic outcome. Meanwhile, my efforts in combining supramolecular nanovalves with silica nanoparticles have yielded in many different types of stimuli-responsive drug delivery systems that have demonstrated unprecedented efficacies in treating varies diseases, including cancer, infectious disease and respiratory system diseases.


3. Spectroscopic Methods for Probing Microenvironment at Nanoscale

Aside from the control release applications, supramolecular nanovalves also provide unique opportunities to probe nanoscale microenvironments. One this basis, I have employed spectroscopic methods that when combined with the nanovalves, are capable of providing detailed information on the molecular mobility as well as local environment rigidity inside a nanopore. This technology provides the basis of kinetically studying protein properties, which is one of my current research directions.


4. Chemical Methods for Integrated Single Cell Analysis

One of the challenges for single cell studies is to simultaneously quantify analytes of different categories, for instance, proteins and metabolites. To overcome this challenge, I have devoted into developing integrated single cell assays using surface chemistry and supramolecular chemistry. I have established several orthogonal chemical probes that can quantify different metabolites. Combined with BioMEMS platforms for protein measurements, these probes lead to integrated single cell metabolic/proteomic assays that provide unprecedentedly rich information on cellular heterogeneity.


5. Contribution to Other Nanotechnology Fields

In addition to biomedical-oriented research, I have also made significant contributions to other nanotechnology fields, especially in nanomaterial fabrication and photocatalysis. I have developed novel nanocomposites that exhibit great photocatalytic properties under visible light. These studies have led to 2 patents, on which I am the main inventor. I have also contributed in the development of inorganic/organic hybrid nanomaterials for chemical sensing and environmental detoxing purposes.


**Complete List of Published Work in MyBibliography:**

Biographical Sketches
Roya Zandi

Professional Preparation:
Ph. D. Physics, December 2001
University of California, Los Angeles (UCLA).

B.S. Physics, summa cum laude, December 1992
California State University, Northridge (CSUN).

Appointments:
July 2014 – present
Professor of Physics, University of California, Riverside.

July 2010 – June 2014
Associate Professor of Physics, University of California, Riverside.

July 2005 – June 2010
Assistant Professor of Physics, University of California, Riverside.

January 2002-September 2005
Postdoctoral scholar, Department of Chemistry and Biochemistry, (UCLA).

September 2002 – July 2005
Postdoctoral visitor, Department of Physics, Massachusetts Institute of Technology (MIT).

Summer 1997
Research Assistant in developing the UCLA physics department web site on “Contributions of 20th Century Women to Physics.”

Publications:
Five publications most relevant to proposed project:

Five other significant publications:
1. Dong Gui, Sharad Gupta, Jun Xu, Roya Zandi, Sarjeet Gill, I-Chueh Huang, A.L.N. Rao,


Awards and Honors:
– UC Regents’ Faculty Fellowship Award 2013-2014.
– UC President’s Postdoctoral Fellowship 2002-2004.
– UC Regents’ Faculty Fellowship Award 2008-2009.
– Outstanding Teaching Award, Physics Department, UCLA 1997-1998.
– Outstanding Scholarly and Research Work Award, Physics Department, UCLA Fall 1996-1997.
– Physics Department Fellowship, UCLA 1995-1996.
– Outstanding Senior Award, Physics Department, CSUN FALL 1992.
– Outstanding Junior Award, School of Science and Mathematics, CSUN, Spring 1991.

Synergistic Activities:
\[ \text{Co-organizer of the workshop on “The Theory and Practice of Fluctuation-Induced Interactions” at the Kavli Institute for Theoretical Physics at the University of California, Santa Barbara, in the period 18 August - 21 November, 2008} \]
\[ \text{Co-organizer of “An Interdisciplinary Workshop on Physical Aspects of Viral Assembly and Infectivity” to be held at UCLA, in May 7-9 2009.} \]
\[ \text{Co-organizer of the topical session “Self-assembly at the Nanoscale” at the 87th ACS Colloid and Surface Science Symposium held at UCR, June 24-26 2013.} \]
\[ \text{Co-organizer of the workshop on “Physics and Mathematics of Viral Assembly,” held in Aspen Center for Physics, June 14-July 5 2014.} \]
\[ \text{Creation of the first graduate level biological physics course at UCR, Phys. 246.} \]
\[ \text{Creation of a series of undergraduate biological physics courses at UCR, Phys. 145A, 145B and 145C.} \]

Research Support:
\[ \text{“Physics of Virus Assembly: Energetics and Dynamics,” NSF–DMR, $270,000, 09/15/2013-09/14/2017.} \]
\[ \text{“High Precision Casimir Force Measurements”, Co-PI, NSF–PHY, $380,000.} \]
A. Education/Training

<table>
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<tr>
<th>INSTITUTION AND LOCATION</th>
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<tr>
<td>University of Science &amp; Technology of China</td>
<td>B.S.</td>
<td>07/98</td>
<td>Chemistry</td>
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<tr>
<td>Iowa State University</td>
<td>Ph.D.</td>
<td>07/03</td>
<td>Analytical Chemistry</td>
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<tr>
<td>Los Alamos National Laboratory</td>
<td>Postdoctoral</td>
<td>06/06</td>
<td>Bioanalytical Chemistry</td>
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B. Positions and Honors

Positions and Employment

- 2003-2006 Post-doctoral Research Associate, Chemistry Division, Los Alamos National Lab
- 2006-2012 Assistant Professor, Department of Chemistry, University of California, Riverside
- 2012-2016 Associate Professor, Department of Chemistry, University of California, Riverside
- 2016-present Professor, Department of Chemistry, University of California, Riverside

Honors and Awards

- 2005 Los Alamos Achievement Award
- 2011 National Science Foundation CAREER Award

C. Peer-Reviewed Publications

Brief Summary of Research Areas

Our work focuses on two main research topics: 1) Discovery of valuable biomarkers and development of new techniques and devices for rapid, on-site detection of target molecules; and 2) Study of nano-bio interface to guide better design and applications of biofunctional nanomaterials. The biomarkers we are interested in include post-translationally
modified proteins and peptides, non-coding RNAs, extracellular vesicles, as well as environmental contaminants. Separation-enabled sensing is the main theme for our research work. Diverse separation techniques, like nanomaterial-based solid-phase extraction, flow-field flow fractionation, and capillary electrophoresis, are used and modified to improve marker detection and to discover new markers. Moreover, we develop diverse signal amplification strategies for enhancement of biomarker detection, taking advantage of nanomaterials and isothermal nucleic acid amplification.

At the University of California, Riverside (*Corresponding Author)


C-25. J. Yao, K. Flack, L. Ding, W. Zhong*. Tagging the rolling circle products with nanocrystals clusters for cascade signal increase in the detection of miRNA. *Analyst*, 2013, 138, 3121-3125.


Before Coming to the University of California, Riverside


D. Patents and Invention Disclosures


E. Research Support

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<tr>
<td>Synthetic Receptor-Based Arrays for Sensing Post-Translationally Modified Proteins and Peptides (PI)</td>
<td>NSF</td>
<td>07/01/2017-06/30/2020</td>
<td>$495,000</td>
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<td>Nano-response: Immune stimulation, microbiome perturbation and impacts from protein corona (PI)</td>
<td>NIH/NIEHS</td>
<td>09/31/16 –08/31/21</td>
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<td>3-Dimensional profile of circulating miRNA for early cancer detection (PI)</td>
<td>National Institutes of Health (NCI)</td>
<td>04/23/15 –03/31/19</td>
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<td>Development of the prototype of the microRNA Differential Isolation Platform (PI)</td>
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<td>CAREER: Signal Amplification by Cation Exchange in Ionic Nanocrystals (PI)</td>
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<td>07/01/15-06/20/16</td>
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<td>Direct Recruitment of Ribosomes by RNA Polymerase might guide the Evolution of Bacterial Pathogens (Co-I)</td>
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<td>Nanomaterials coated with antigenic proteins as immunostimulatory complexes (PI)</td>
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<td>07/01/14-06/30/15</td>
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<td>Impact of Protein Corona on Nanotube-Conjugated CpG Immunotherapy for Glioma (Co-PI)</td>
<td>City of Hope and UC Riverside</td>
<td>02/01/13-01/31/15</td>
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<tr>
<td>Discovery of Virus-Binding Aptamers (PI)</td>
<td>UCR IIGB Core Instrument Facility</td>
<td>12/14-05/15</td>
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<td>Study Protein-Nanomaterial Interactions and Their Impacts on Protein Activity (PI)</td>
<td>National Institutes of Health</td>
<td>09/01/10-08/30/12</td>
<td>$415,775</td>
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</table>
One-step miRNA Analysis for Study of Cancer Development (PI)

| Cancer Research Coordinating Committee, UC | 07/01/11-06/30/12 | $50,000 | Completed |

High-Throughput Screening of siRNA Expression Using Rolling Circle Amplification (PI)

| The Institute for Integrative Genome Biology (IIGB) of UCR | 11/01/07-07/30/08 | $50,000 | Completed |

Separation of Protein Complex by Micro-Asymmetrical Flow-Field Flow Fractionation (PI)

| The Academic Senate Committee on Research of UCR | 07/01/07-07/30/08 | $4,000 | Completed |

F. Professional Services

**Service on Professional Board**

Analytical Chemistry Feature Panel, 2015-2018

Analytical and Bioanalytical Chemistry, International Advisory Board, 2017-present

**Teaching and service at UCR**

Graduate advisor for Environmental Toxicology Program, 2012-present

Undergraduate advisor for Chemistry, 2016-present

Instructor for Advanced Analytical Separation, Advanced Bioanalytical Chemistry, Quantitative Analysis, Instrumental Methods and Analysis, General Chemistry

**Organized Symposia at Conferences**


“Innovation in Chemical Sensing and Separation Systems toward Advanced Chemical Analysis”.


F-9. (Co-Chair; lead organization of all four electrophoresis symposia) Federation of Analytical Chemistry and Spectroscopy Societies Annual Conference (SCIX 2012), Kansas City, Missouri, October 2012.


F-13. The Pittsburgh Conference (PittCon), Orlando, Florida, March 2010. Analytical Chemistry for the Study of Nanotoxicity. (Accepted symposium proposal, and reported as a cover story in Chemical & Engineering News)


Reviewed Proposals


NASA, Panelist, 2016.

Ad-hoc reviewer for Hongkong research council 2012-2017; Korean National Science Foundation 2015; Deutsche Forschungsgemeinschaft (DFG) 2016.

Reviewed Journal Articles

ACS Applied Materials & Interfaces
Analyst
G. Invited Presentations

At Conferences


**At Universities**


G-23. University of Iowa, Iowa City, IA, December 2017.


G-25. Sun Yat-Sen University, Guangzhou, China, October 2016.


G-29. HongKong University of Science and Technology, HongKong, China. August 2014.

G-30. HongKong Baptist University, HongKong, China. August 2014.


G-34. Xiamen University, Xiamen, China. August 2013. *Analytical Chemistry at the Nano-Bio Interface.*


CV, Wenwan Zhong, University of California, Riverside


H. Advisees

**Graduate Students**

Ni Li, Ph.D. Research Scientist, Abbott Laboratories 09/2006-06/2011, Chemistry

Lei Ren, Ph.D. Research Scientist, Bokai Pharma 09/2007-08/2012, Environmental Toxicology Program 2011-2012 Dissertation Year Program Fellowship

Jingjing Yao, Ph.D. Biopharma, Inc. 09/2007-08/2013, Chemistry

Samantha Schachermeyer, Ph.D. Chlorox, Inc. 01/2008-12/2013, Chemistry

Shang Zeng, Ph.D. Amgen, Inc. 09/2009-08/2014, Chemistry

Jonathan Ashby, Ph.D. Postdoctoral researcher, UC Davis 01/2010-08/2014, Chemistry NSF Graduate Research Fellowship, 06/11-05/14

Kenneth Flack Hewlett Packard, Inc.
<table>
<thead>
<tr>
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<th>Institution</th>
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<tbody>
<tr>
<td>Yang Liu</td>
<td>09/2012-present, Environmental Toxicology Program</td>
<td>09/2012</td>
<td>present</td>
<td>Environmental Toxicology Program</td>
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<tr>
<td>Luis Jimenez</td>
<td>09/2012-present, Program of Biomedical Sciences</td>
<td>09/2012</td>
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<tr>
<td>Yaokai Duan</td>
<td>09/2013-present, Chemistry</td>
<td>09/2013</td>
<td>present</td>
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<tr>
<td>Song Zhe</td>
<td>09/2014-present, Environmental Toxicology Program</td>
<td>09/2014</td>
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<tr>
<td>Jiwon Lee</td>
<td>09/2014-present, Chemistry</td>
<td>09/2014</td>
<td>present</td>
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<tr>
<td>Gary Brent Adkins</td>
<td>07/2015-present, Chemistry</td>
<td>07/2015</td>
<td>present</td>
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<tr>
<td>Michael Trihn</td>
<td>07/2015-present, Chemistry</td>
<td>07/2015</td>
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<tr>
<td>Kaizhu Guo</td>
<td>07/2016-present, Chemistry</td>
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<td>present</td>
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<tr>
<td>Roxana Coreas</td>
<td>07/2016-present, Environmental Toxicology Program</td>
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**Postdocs**

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<tr>
<td>Jishan Li</td>
<td>12/2006-02/2010; Professor, College of Chemistry and Chemical Engineering, Hunan University, China</td>
<td>12/2006</td>
<td>02/2010</td>
<td>University of California, Riverside</td>
</tr>
<tr>
<td>Xiaogang Han</td>
<td>09/2010-08/2011; Postdoc, University of Maryland, College Park</td>
<td>09/2010</td>
<td>08/2011</td>
<td>University of California, Riverside</td>
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<tr>
<td>Runtao Zhong</td>
<td>07/2010-02/2012</td>
<td>07/2010</td>
<td>02/2012</td>
<td>University of California, Riverside</td>
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<tr>
<td>Hui Wang</td>
<td>05/2012-08/2013</td>
<td>05/2012</td>
<td>08/2013</td>
<td>University of California, Riverside</td>
</tr>
<tr>
<td>Ju-Yong Lee</td>
<td>08/2015-present</td>
<td>08/2015</td>
<td>present</td>
<td>University of California, Riverside</td>
</tr>
<tr>
<td>Wen Shen</td>
<td>01/2016-present</td>
<td>01/2016</td>
<td>present</td>
<td>University of California, Riverside</td>
</tr>
<tr>
<td>Xiaoni Fang</td>
<td>07/2016-present</td>
<td>07/2016</td>
<td>present</td>
<td>University of California, Riverside</td>
</tr>
</tbody>
</table>

**Visiting Scholars/Students**

<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
<th>Start Date</th>
<th>End Date</th>
<th>Institution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liang Ding</td>
<td>08/2011-02/2012; Professor, School of Medicine, Hebei University</td>
<td>08/2011</td>
<td>02/2012</td>
<td>University of California, Riverside</td>
</tr>
<tr>
<td>Chao Shi</td>
<td>05/2012-02/2013; Professor, Qingdao University of Science and Technology</td>
<td>05/2012</td>
<td>02/2013</td>
<td>University of California, Riverside</td>
</tr>
<tr>
<td>Zhigang Wang</td>
<td>08/2012-04/2013; Professor, Yang Zhou University</td>
<td>08/2012</td>
<td>04/2013</td>
<td>University of California, Riverside</td>
</tr>
<tr>
<td>Xiaofeng Chen</td>
<td>09/2014-02/2015; Professor, Yang Zhou University</td>
<td>09/2014</td>
<td>02/2015</td>
<td>University of California, Riverside</td>
</tr>
<tr>
<td>Fang Chen</td>
<td>09/2014-08/2015; Professor, Hua Zhong University of Science &amp; Technology</td>
<td>09/2014</td>
<td>08/2015</td>
<td>University of California, Riverside</td>
</tr>
<tr>
<td>Ting Deng</td>
<td>03/2015-present; Associate Professor, Hunan University</td>
<td>03/2015</td>
<td>present</td>
<td>University of California, Riverside</td>
</tr>
<tr>
<td>Fang Si</td>
<td>12/2013-02/2015; Visiting Student, Dong Hua University</td>
<td>12/2013</td>
<td>02/2015</td>
<td>University of California, Riverside</td>
</tr>
<tr>
<td>Yumin Wang</td>
<td>09/2016-09/2017; Visiting Student, Hunan University</td>
<td>09/2016</td>
<td>09/2017</td>
<td>University of California, Riverside</td>
</tr>
<tr>
<td>Hua Wang</td>
<td>10/2016-10/2017; Professor, Yansheng University</td>
<td>10/2016</td>
<td>10/2017</td>
<td>University of California, Riverside</td>
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Undergraduate Students

Long-term Participants in Group Research:

Anh Nguyen 07/2007-06/2009; co-author in C-18
Hong Kim 07/2007-06/2009; co-author in C-17
Sonja Kress NSF International REU Program, summer 2007
Carolyn Jablonowski NSF REU Program, summer 2008; co-author in C-14
Jimmy Vo Analytical Assistant Chemist, Mitsui Chemical Group 07/2009-08/2012
Kuwana-Sawyer award for undergraduate research in Analytical Chemistry, 2011
Undergraduate Research Grant of UCR, 07/2010-05/2011
Michael Pham 07/2011-06/2013 (Honor student thesis program)
Erik Ligans 04/2013-12/2014 (Honor student thesis program)
Merissa Gonzales 08/2013-present (MARC*U program)
Michael Tamsi 08/2013-07/2014
Abdel-Kareem Khatib 05/2014-09/2014
Nancy Ortega 05/2014-05/2015
Joshua Berlarde 05/2014-present
Sabrina Sedano 05/2015-present
Yomara Mendez 05/2015-present
Erica Sun 04/2017-present

I. Professional Affiliations

American Chemical Society; American Association for the Advancement of Science
Appendix II. Faculty letters of intent to participate

Huiwang Ai (Assistant Professor, Chemistry, Ph.D.)
Mark Alber (Distinguished Professor, Physics, Ph.D.)
John Barton (Assistant Professor, Ph.D., Physics, arriving 1/1/18)
Gregor Blaha (Assistant Professor, Biochemistry, Ph.D.)
Chia-en Chang (Associate Professor, Chemistry, Ph.D.)
Richard Cardullo (Professor, Biology, Ph.D.)
Richard Debus (Professor, Biochemistry, Ph.D.)
Li Fan (Associate Professor, Ph.D.)
Theodore Garland (Distinguished Professor, Biology, Ph.D.)
Joseph Genereux (Assistant Professor, Chemistry, Ph.D.)
Russ Hille (Distinguished Professor, Biochemistry, Ph.D.)
Richard Hooley (Associate Professor, Chemistry, Ph.D.)
Darrel Jenerette (Associate Professor, Botany and Plant Sciences, Ph.D.)
Ryan Julian (Professor, Chemistry, Ph.D.)
Umar Mohideen (Professor, Physics, Ph.D.)
Len Mueller (Professor, Chemistry, Ph.D.)
Dawn Nagel (Assistant Professor, Botany and Plant Sciences, Ph.D.)
Seán O’Leary (Assistant Professor, Biochemistry, Ph.D.)
Jeff Perry (Assistant Professor, Biochemistry, Ph.D.)
Nicole Rafferty (assistant Professor, Biology, Ph.D)
Carolyn Rasmussen (Assistant Professor, Botany and Plant Sciences, Ph.D.)
Louis Santiago (Associate Professor, Botany and Plant Sciences, Ph.D.)
Jikui Song (Assistant Professor, Biochemistry, Ph.D.)
Yinsheng Wang (Professor, Chemistry, Ph.D.)
Min Xue (Assistant Professor, Chemistry, Ph.D.)
Wenwang Zhong (Professor, Chemistry, Ph.D.)
Roya Zandi (Professor, Physics, Ph.D.)
June 15, 2016

Russ Hille
Department of Biochemistry
CAMPUS

Dear Russ:

I write to express my enthusiasm to participate in the graduate program in Biophysics that is being proposed. My own expertise is in the area of protein engineering and chemical biology. In particular, my research group is engineering novel molecular probes to peer into cells and brains to understand their communications. We use a collection of innovative techniques, such as protein engineering, fluorescence and bioluminescence imaging, synthetic chemistry and mass spectrometry, to dissect signaling pathways involving redox-active molecules, neurotransmitters, and protein post-translational modifications (PTMs). Our research direction is well aligned with the proposed graduate program in Biophysics. I will enthusiastically support the Program.

Sincerely,

Huiwang Ai
Assistant Professor of Chemistry
Professor Russ Hille  
Department of Biochemistry  
University of California, Riverside  
CAMPUS

August 31, 2016

Dear Russ:

I write to express my enthusiasm to participate in the graduate program in Biophysics that is being proposed. My own expertise is in the area of computational biophysics and mathematical and computational biology.

Sincerely,

Mark Alber
Distinguished Professor
Department of Mathematics
Office: Surge 246
University of California, Riverside
Tel: (951) 827-3113
Fax: (951) 827-7314
e-mail: malber@ucr.edu

Fellow of the American Association for the Advancement of Science (AAAS)
Deputy Editor, PLoS Computational Biology
Associate Editor, Bulletin of Mathematical Biology (Springer)
Professor Emeritus (Early retirement)
University of Notre Dame
Adjunct Professor of Medicine
Indiana University School of Medicine
May 21, 2017

Russ Hille  
Distinguished Professor of Biochemistry  
1643 Boyce Hall  
University of California  
Riverside, CA 92521

Dear Prof. Hille,

Following your invitation, I am writing to indicate my interest in participating in the interdepartmental graduate program in Biophysics at the University of California, Riverside. I would be excited to take part in this interdisciplinary program.

Together with this letter I am including a copy of my CV. Please do not hesitate to contact me for any further information that may be helpful.

Sincerely,

John P Barton
August 19, 2016

Russ Hille  
Department of Biochemistry  
CAMPUS

Dear Russ:

I write to express my enthusiasm to participate in the graduate program in Biophysics that is being proposed. I believe that my expertise in X-ray crystallography and my interest in biophysical methods for characterizing of protein ribonucleic acid particles matches well with the stated goals the proposed program.

Sincerely,

Gregor Blaha  
Assistant Professor  
Department of Biochemistry
16, August 2016

Russ Hille  
Department of Biochemistry  
CAMPUS

Dear Russ:

I write to express my enthusiasm to participate in the graduate program in Biophysics that is being proposed. My own expertise is in the area of membrane biophysics, advanced imaging technologies, and modeling dynamic signaling events in living cells. Our recent research involves looking at the molecular mechanisms for sperm activation and relating it to changes in flagellar behavior in insects, especially mosquitoes. Although mainly cellular in focus, our work bridges many disciplines including biochemistry, bioengineering, developmental biology, and molecular genetics.

I am truly excited about this program and feel that the time is right for a biophysics program at UCR. I look forward to moving ahead with this initiative and will actively participate in all aspects of the program.

Sincerely,

Richard A. Cardullo, PhD  
Howard H Hays Jr. Chair, University Honors  
Professor of Biology
Russ Hille  
Department of Biochemistry  
CAMPUS

Dear Russ:

I write to express my enthusiasm to participate in the graduate program in Biophysics that is being proposed. My own expertise is in the area of molecular recognition. My group is particularly interested in understanding non-covalent protein-ligand binding kinetics and thermodynamics using molecular mechanics methods such as molecular dynamics simulations, Brownian dynamics simulations, and molecular docking, just to name a few.

Sincerely yours,

Chia-en A. Chang, Ph.D.  
Association Professor of Chemistry  
University of California, Riverside
August 19, 2016

Russ Hille, Distinguished Professor of Biochemistry
Department of Biochemistry
CAMPUS

Dear Russ:

I write to express my enthusiasm at participating in the graduate program in Biophysics that is being proposed. My own expertise is in the area of spectroscopic analysis of the oxygen-evolving process in photosynthesis, particularly vibrational spectroscopy. Specifically, my laboratory employs FTIR difference spectroscopy to characterize mutant core complexes of Photosystem II containing single amino acid substitutions of residues identified crystallographically or computationally as potentially participating in networks of hydrogen bonds near the catalytic Mn₄CaO₅ cluster. Identifying these residues will improve our understanding of the dynamic mechanism of O₂ production by the Mn₄CaO₅ cluster and will provide insight into the design of new generations of synthetic catalysts that convert sunlight into useful forms of storable energy. Attached please find a current cv.

Sincerely,

Richard J. Debus
July 10, 2016

Russ Hille  
Department of Biochemistry  
CAMPUS

Dear Russ:

I write to express my enthusiasm to participate in the graduate program in Biophysics that is being proposed. My own expertise is in the area of protein X-ray crystallography, protein chemistry and DNA repair.

Sincerely,

Li Fan  
Associate Professor &  
Director of Macromolecular X-ray Crystallography Core Facility
Dear Russ:

I write to express my enthusiasm to participate in the graduate program in Biophysics that is being proposed. My own relevant expertise is in the systems biology of locomotor behavior and exercise physiology, approached from both genetic and modeling perspectives. I also have a great deal of experience in statistical analyses of complex systems and experimental designs. In addition, as Director of UCR’s Institute for the Development of Educational Applications (IDEA), I would be interested in developing online curricula for the program, should that seem appropriate.

Please let me know if you need any further information, and best luck with the proposal.

Sincerely,

Theodore Garland, Jr., Distinguished Professor
Office Phone: (951) 827-3524
Facsimile: (951) 827-4286 (not confidential)
Email: tgarland@ucr.edu
http://www.biology.ucr.edu/people/faculty/Garland.html
http://scholar.google.com/citations?hl=en&user=iSSbrhwAAAAJ

Director, UCR Institute for the Development of Educational Applications

Editor in Chief, Physiological and Biochemical Zoology

Fail Lab: Episode One
http://testtube.com/faillab/zoochoisis-episode-one-evolution
http://www.youtube.com/watch?v=c0msBWYzU0
September 5, 2016

Russ Hille
Department of Biochemistry
CAMPUS

Dear Russ:

I write to express my enthusiasm to participate in the graduate program in Biophysics that is being proposed. My own expertise is in the area of protein homeostasis, the balance between protein conformation and fate. Specifically, my group develops tools to determine the molecular consequences of cellular networks that regulate protein homeostasis. The physical and chemical underpinnings of these biological processes are poorly understood, and cross-disciplinary students who understand both biological systems, and the physical basis for the methods that we are developing to probe them, will be a natural fit for my research program. A biophysics graduate program would be an ideal source to attract these graduate students, while at the same time offering them an educational program that is tailored to the interdisciplinary background necessary to tackle these research projects.

As a participant, I commit to recruit students into the program, to serve on related committees, and to contribute to the associated seminar series.

Sincerely,

Joseph Genereux
Department of Chemistry
951-827-3759
To Whom It may Concern:

I write to convey my strong interest in creating and participating in a new graduate program in Biophysics at UC Riverside, as reflected in my involvement in the preparation of the present proposal.

With best regards,

Russ Hille, Ph.D.
Distinguished Professor of Biochemistry
August 4th, 2016

Dear Russ:

This letter is to confirm my intent to participate in the UC Riverside Biophysics program. I believe this is an important new direction for the UCR science faculty, and will be a valuable addition for the campus as it seeks to expand and improve.

If you require any more information, please feel free to contact me.

Richard Hooley
DEPARTMENT OF BOTANY AND PLANT SCIENCES  
CALIFORNIA 92521-0122  

RIVERSIDE,  

June 15, 2016  

Russ Hille  
Department of Biochemistry  
CAMPUS  

Dear Russ:  

I write to express my enthusiasm to participate in the graduate program in Biophysics that is being proposed. My own expertise is in the area of landscape patterns of ecosystem functioning. Much of this work depends strongly on an understanding of biophysics and frequently such understanding is a limiting reagent for my students research. My research depends on biophysical concepts related to energy balance, light absorption, and fluid transport. These processes all rely at the biophysics interface. For example, energy balance dynamics are affected by many leaf structural and evaporative characteristics. These plant-based dynamics strongly interact with energy availability and transport between the vegetation and atmosphere. These dynamics are only understandable only in the context of biological processes interaction with physics based dynamics.  

Sincerely,  

Darrel Jenerette  
Associate Professor  
Department of Botany and Plant Sciences
August 19, 2016

Russ Hille
Department of Biochemistry
UCR

Dear Russ:

I write to express my enthusiasm to participate in the graduate program in Biophysics that is being proposed. My own expertise is in the area of biomolecular structure determination, noncovalent interactions, spectroscopy, and mass spectrometry.

Sincerely,

Department of Chemistry
DEPARTMENT OF PHYSICS & ASTRONOMY

Umar Mohideen
Professor
Department of Physics & Astronomy
University of California
Riverside, CA 92521

RIVERSIDE, CALIFORNIA 92521-0122
August 22, 2016

Dear Russ:

I write to express my enthusiasm to participate in the graduate program in Biophysics that is being proposed. My own expertise is in the area of single molecule force spectroscopy, nanoscale imaging of cells and mechanical elasticity of cell parts. The realization of the Biophysics program at UCR would be valuable to the whole campus by providing a pool of talented students who can interact with the ongoing multidisciplinary biophysics research.

Sincerely,

Umar Mohideen
June 15, 2016

Russ Hille  
Department of Biochemistry  
CAMPUS

Dear Russ:

I write to express my enthusiasm to participate in the graduate program in Biophysics that is being proposed. My own expertise is in the area of solid-state NMR spectroscopy and biological chemistry. The major goal of my research is to understand the transformation of substrate to product in enzyme active sites at the atomic level – that is to define the position of all atoms, including protons. To accomplish this, we are pioneering the development and application of NMR-assisted crystallography – the synergistic combination of solid-state NMR, X-ray crystallography, first-principles (ab initio) and molecular dynamics computational approaches, and synthetic organic chemistry – to enzyme systems. Specifically, my group is establishing the atomic-level details in the enzymatic transformation of substrate to product in pyridoxal-5'-phosphate-requiring enzymes. By doing so, we are advancing an understanding of the relationship between chemical structure, conformational dynamics, and enzyme mechanism.

I look forward to being a strong, contributing member of the Biophysics graduate program at UCR.

Sincerely,

Leonard J. Mueller  
Professor and Vice-Chair  
Department of Chemistry
May 22, 2017

RE: Biophysics Graduate Program at UCR

Dear Russ,

I am writing this letter to inform you of my interest in participating in the Biophysics Graduate Program if created. My CV is attached, and please let me know if you have any questions.

Sincerely,

--

Dawn Nagel, Ph.D.
Assistant Professor
Department of Botany and Plant Sciences
1129 Batchelor Hall
University of California
Riverside, CA 92507
dawnn@ucr.edu
Office: (951) 827-4425
August 5th, 2016

Russ Hille,
Distinguished Professor of Biochemistry,
University of California, Riverside,
2404 Boyce Hall,
Riverside, CA 92521-0122.

Re: Interdepartmental Graduate Program in Biophysics

Dear Russ,

I would like to express my enthusiastic support for the proposed Interdepartmental Graduate Program in Biophysics at the University of California, Riverside.

During my past six years as a postdoctoral researcher at Stanford University School of Medicine, I was involved both in performing and in mentoring trainees in Biophysics research, focusing on applications of single-molecule fluorescence microscopy to study complex biochemical systems. Our research was a natural fit for, and benefitted enormously from students in the Biophysics program. The potential of a similar program at UCR is therefore really exciting. I will be delighted to participate in the program as it is established.

If I can assist in any way, please do not hesitate to contact me.

Sincerely,

Seán O’Leary
RE: Interest in participating in the Biophysics Program at UCR

Dear Russ,

I am most keen to participate in the interdepartmental graduate program in the field of Biophysics, which is under consideration at UCR. I think this is a truly excellent idea, leveraging the molecular and spectroscopic biophysics based expertise of existing Faculty at UCR, as well as being highly complimentary to existing graduate programs.

Best regards,

Jeff
May 16, 2017

Russ Hille  
Distinguished Professor of Biochemistry  
1643 Boyce Hall  
University of California  
Riverside, CA 92521

Dear Dr. Hille,

I am writing to express interest in the initiative to create a graduate program in Biophysics at the University of California, Riverside. I am an Assistant Professor in the Department of Biology, and my research focuses on the community ecology of plants and pollinators under global change. Systems biophysics is particularly relevant to my research area. I am happy to offer my participation in this initiative.

Sincerely,

Nicole Rafferty, Ph.D.  
Assistant Professor  
nicole.rafferty@ucr.edu  
951-827-3800
May 18, 2017

Dear Professor Russ Hille,

Thank you for asking me to join the graduate program in biophysics. This is indeed one of the future research directions of my lab. For example, finding a student interested in using atomic force microscopy to measure cell wall properties or examining protein dynamics using single molecule imaging or other biophysical experiments would be valuable. In addition, establishing collaboration with colleagues with this type of expertise (and equipment) would be useful.

I would be happy to join the biophysics graduate program and contribute live-cell imaging expertise. Attached please find a recent CV. Please contact me if you have any questions.

Sincerely,

Carolyn G. Rasmussen, Ph.D.
Department of Botany and Plant Sciences
carolyn.rasmussen@ucr.edu
June 15, 2016

Russ Hille
Department of Biochemistry
CAMPUS

Dear Russ:

I write to express my enthusiasm to participate in the graduate program in Biophysics that is being proposed. My own expertise is in the area of plant physiological ecology, which incorporates a vast amount of biophysics within our study of the physics of water transport in plants, the conversion of light energy to carbon-based compounds, and the energy exchange between the vegetated surfaces and the atmosphere. The maintenance of plant tissues within biological temperature ranges and the responses of plants to climate change also fall within the discipline of biophysics.

Several of my courses taught at UCR also incorporate components of biophysics, including BIOL 05B (Introduction to Organismal Biology), BPSC 143 (Plant Physiology), but likely most importantly, my graduate course, BPSC 243 (Plant Physiological Ecology) could be an important potential component of the graduate curriculum for this program.

Sincerely,

Louis S. Santiago
Associate Professor of Botany & Plant Sciences
and
Research Associate, Smithsonian Institution
June 15, 2016

Russ Hille
Department of Biochemistry
CAMPUS

Dear Russ:

I write to express my enthusiasm to participate in the graduate program in Biophysics that is being proposed. My own expertise is in the area of structural biology and epigenetics. We study molecular mechanisms that underlie epigenetic regulation using structural approaches (X-ray crystallography and NMR spectroscopy). In the past, we have revealed the structure-function relationships of several crucial enzymes involved in chromatin modification or pathogen-host interaction (Cell 2010, 141:1183-94; Science 2011, 331:1036-40; Science 2012, 335:709-712; Nature 2012 484:115-9; Cell Rep 2015, 12:1400-6; Cell Rep. 2016, 14:493-505; Nat. Struct. & Mol. Bol. 2016).

Sincerely,

Jikui Song
Assistant Professor
Department of Biochemistry
Phone: 951-827-4221
Email: jikui.song@ucr.edu
Russ Hille  
Department of Biochemistry

September 6, 2016

Dear Russ:

I write to express my enthusiasm to participate in the graduate program in Biophysics that is being proposed. My own expertise is in the area of using mass spectrometry for studying the covalent modifications of biological molecules, including DNA, RNA and proteins.

Sincerely,

Yinsheng Wang  
Professor of Chemistry
Aug 20, 2016

Russ Hille
Department of Biochemistry
CAMPUS

Dear Russ:

I write to express my enthusiasm to participate in the graduate program in Biophysics that is being proposed. My own expertise is in the area of bioanalytical chemistry and my group aims to develop novel chemical probes for detecting and imaging large biomolecules. A large part of my research falls into the realm of Biophysics, and I will be able to contribute to the teaching of related courses in the program.

I believe that the proposed Biophysics graduate program will largely aid in the interaction of related research groups and the integration of campus resources. In addition, it will be a great program where students can obtain interdisciplinary knowledge and develop a promising career track.

I look forward to hearing about the updates on the proposal progress.

Sincerely,

Min Xue
Assistant Professor
Department of Chemistry
University of California, Riverside
Dear Russ:

I would like to express my enthusiasm to participate in the graduate program in Biophysics that is being proposed. As you know, I have been working on the physics of virus assembly and have created several biophysics courses offered in the Physics Department at UCR. In particular, I have created and taught the undergraduate Physics courses 145A, B, C and the graduate level Biophysics 246. Physics 145A was offered a couple years ago and I had 15 students in the course. This number is quite high for an upper division Physics course. We also have several students in the Physics Department who are completing their BS in the Biophysics track. We have been attracting very good undergraduate students to this program. Our graduate students working on Biophysics projects are also very strong. As a matter of fact, this year the award for the best Ph.D. graduating student was given to one of my students who had completed several Biophysics projects. I am very excited about the Biophysics graduate program and am eager to participate in and assist you in implementing the program.

Sincerely,

Roya Zandi
Professor of Physics
University of California
Riverside, CA 92521
Tel: (951) 827-2096
Dear Dr. Russ Hille,

It is really a good news to me that you are proposing a new graduate program in Biophysics at UCR. I think it is a much needed program for our campus to meet the needs of recruiting students with good background in biology and physics who can be trained and conduct interdisciplinary research at the areas related to biophysics. Since the research work in my group is centered on bioanalytical chemistry and biophysics is critical for us to develop new techniques and study new biological problems, it will be my great pleasure to participate in this program. If approved, I will be happy to recruit students from this program to my group and collaborate with other faculty members in the program. Hope with the collective efforts from us, this program will be approved and run well on our campus.

Thank you very much for your kind invitation.

Sincerely,

Wenwan Zhong, Professor;
Department of Chemistry;
University of California;
Riverside, CA
Appendix III. Letters from UCR Department Chairs and UC Biophysics Program Directors

UCR Department Chairs

Richard Debus, Chair, Department of Biochemistry, UC Riverside
Michael Allen, Chair, Department of Biology
Patricia Springer, Chair, Department of Botany and Plant Sciences, UC Riverside
Jingsong Zhang, Chair, Department of Chemistry, UC Riverside
Kenneth Barish, Department of Physics and Astronomy, UC Riverside

Directors of other interdepartmental graduate programs in Biophysics at UC campuses

Template request letter

Dr. James Hurley
Graduate Program Chair
Biophysics Graduate Group
574 Stanley Hall, MC 3220
Berkeley, CA 94720
In care of: katechase@berkeley.edu

John Voss, PhD
Director, Biophysics Graduate Group
227 Life Sciences
One Shields Avenue
Davis, CA 95616
jcvoss@ucdavis.edu

A letter was also requested from Tanja Kortemme, PhD, Director, Biophysics Graduate Program
University of California, San Francisco (UCSF), but no response was received.
August 29, 2016

Russ Hille
Distinguished Professor of Biochemistry
1463 Boyce Hall

Dear Russ,

I am writing to express enthusiastic support for the development of a Biophysics Graduate Program at UC Riverside. As you point out in the proposal, substantial expertise in biophysics already exists on campus and the Departments of Biochemistry, Chemistry and Bioengineering have hired numerous biophysically-trained faculty in recent years. Currently, these faculty are spread over multiple departments and colleges and lack a cohesive training environment. An interdepartmental Graduate Program in Biophysics will complement the Department of Biochemistry’s expanding critical mass in structural biochemistry [e.g., X-ray crystallography, NMR, small angle X-ray scattering (SAXS), single-molecule fluorescence measurements (FRET), and various forms of spectroscopy] and link it with the growing expertise in biophysics in the Departments of Chemistry, Bioengineering, Physics & Astronomy, Mathematics, and other departments. This program will have a very positive impact on the research programs of several faculty in the Department of Biochemistry and promote numerous collaborative ventures between faculty all over campus, will complement existing graduate programs in Biochemistry, Chemistry Bioengineering, and Physics & Astronomy, and will increase the campus’s research portfolio, particularly in areas of research of interest to the NIH and faculty in UC Riverside’s School of Medicine. I thus anticipate highly positive interactions with the proposed program.

The development of an interdepartmental graduate program in biophysics has been discussed periodically for many years. I am grateful for your work in developing a specific proposal that takes advantage of the recent hiring of many biophysically-trained faculty throughout campus in recent years.

Sincerely,

Richard J Debus
13 September 2016

To: Russ Hille  
Distinguished Professor of Biochemistry  
1463 Boyce Hall

From: Michael F. Allen, Chair

Re: Biophysics Graduate Program at UC Riverside

Dear Russ,

I am writing to also express support for the development of a Biophysics Graduate Program at UC Riverside. Expertise in biophysics already exists on campus and several Departments, including Biology. We have hired faculty focused in biophysics at higher scales, from biophysical ecology of Professor Ruibal, a founding faculty, to current faculty using biophysical processes to study physiology and ecology. The program will also simultaneously complement the expanding program in adaptive processes directing evolution and understanding environmental stressors from the environment (ecology) affecting survival and reproduction of organisms. It will also link biologists with the growing expertise in the Departments of Chemistry, Bioengineering, Physics & Astronomy, Mathematics, and other departments. Currently, faculty members working in the broader area of biophysics are spread over multiple departments and colleges and lack a cohesive training environment. An interdepartmental Graduate Program in Biophysics will provide a connecting strand for all faculty and will positively impact the research programs of several faculty in the Evolution, Ecology and Organismal Biology (EEOB) graduate program. It will also increase the campus’s research portfolio, particularly in areas of research of interest to the NIH and NSF.

I anticipate highly positive interactions with the proposed program. The development of an interdepartmental graduate program in biophysics has been discussed across the Biology Department for many years, and I appreciate your work in developing this proposal. Please do not hesitate to contact me if you have additional needs or questions.
September 30, 2016

Russ Hille  
Distinguished Professor  
Department of Biochemistry  
University of California  
Riverside, CA 92521

Dear Russ,

I am writing in support of your proposal to develop a Biophysics Graduate program at UCR. An increasing number of faculty in Botany and Plant Sciences have research programs that intersect with biophysics. These include faculty who study cell division, cell shape, plant architecture, and plant physiological processes such as photosynthesis. In addition to our departmental graduate program in Plant Biology, many of our faculty participate in the graduate programs in Cell, Molecular, and Developmental Biology (CMDB), Genetics, Genomics, and Bioinformatics (GGB), Biochemistry and Molecular Biology (BMB), and Ecology, Evolution, and Organismal Biology (EEOB). These programs don't typically attract students interested in using biophysical approaches to address questions. Therefore, I see your proposed Biophysics graduate program as highly complementary to existing programs in the life sciences. It will be a welcome addition to our campus.

Good luck with the proposal.

Sincerely,

Patricia Springer

Patricia Springer
September 16, 2016

Russ Hille  
Distinguished Professor of Biochemistry  
1463 Boyce Hall

Dear Russ,

I am writing to express a strong support for the development of a Biophysics Graduate Program at UC Riverside. As discussed in your proposal, a substantial number of faculty in the areas related to biophysics are already present on the UCR campus, while these faculty are spread over multiple departments and colleges and would benefit from a cohesive graduate training environment in biophysics. The proposed interdepartmental Gradate Program in Biophysics will complement the current expertise in bioanalytical chemistry and biophysics in the Department of Chemistry. The proposed Biophysics program will have a very positive impact on the research programs of several faculty in the Department of Chemistry, promote extensive collaborative research activities between faculty all over the campus, and increase the campus’s research portfolio. I believe that the proposed Biophysics program complements and will have positive interactions with the Chemistry Graduate Program.

Sincerely yours,

Jingsong Zhang
September 16, 2016

Russ Hille
Distinguished Professor
Department of Biochemistry
240B Boyce Hall

Dear Russ,

I am delighted to support the development of an interdepartmental Biophysics Graduate Program at UC Riverside. The program will leverage the expertise in biophysics that already exists on campus from the Departments of Biochemistry, Bioengineering, Chemistry and Physics & Astronomy, and promises to attract top applicants. A Biophysics graduate program will complement the Department of Physics & Astronomy’s biophysics research, which includes sensitive force measurement techniques to study the interaction between single molecules involved in signal transmission in the human brain. Expanding biophysics as a top priority of the department, as reflected in recent hiring plans. The program will also utilize existing Physics classes.

Biophysics is an expanding and vibrant field. I fully support the establishment of an interdepartmental biophysics graduate program. Thank you for working to establish this program.

Sincerely,

Kenneth N. Barish
Chair and Professor
Physics and Astronomy Department
Dear Dr. XXXX:

We are in the process at UC Riverside of proposing an interdepartmental graduate program in Biophysics, leading to the degree of Ph.D. In accordance with the review policy established by the systemwide Coordinating Committee of Graduate Affairs (CCGA), I write to provide you, as Director of an existing comparable program, with a copy of the current draft of our proposal. We would be very grateful for any feedback you may wish to offer, so that the proposal may be made as strong as possible prior to submission.

AA background, please understand that the format and contents of the proposal follow the required outline found in the CCGA Handbook, and that internal and external reviewers will later be asked to address the following four points when examining our final submission:

- Quality and academic rigor of the program
- Adequacy of the size and expertise of faculty to administer the program
- Adequacy of the facilities and budget
- Applicant pool and placement prospects for the graduate students

If you wish to provide feedback, we would appreciate receiving it within four weeks of the date of this letter, as we intend to submit the proposal for campus review at that time. We very much appreciate your taking the time to do so.

With best regards,

Russ Hille, Ph.D.
Distinguished Professor of Biochemistry
September 26, 2016

Professor Russ Hille
Distinguished Professor of Biochemistry
University of California Riverside

Re: Proposed Biophysics Program at UCR

Dear Dr. Hille,

Biophysics has an outsized role to play at the interface between the methods and approaches of physics on the one hand, and, on the other, problems in biology that are of central importance to society, medicine, and fundamental understanding of life. At UC Berkeley, we have had a Biophysics Graduate Program in some form since 1942. Interest from prospective students continues to grow. We had an entering class of 12 this year, a record in recent years. We have sustained interest from faculty, and the presence of the program is an attractor in recruitment. It was certainly important to me when I joined UC Berkeley 3 years ago, and I believe it was a factor in our recent recruitment of Nobelist Eric Betzig. Many of our graduates have gone on to distinguished academic careers, while others have been snapped up upon graduation by Bay Area industry employers. I believe it makes sense for every UC campus to have a Biophysics program, track, or department in some form, and certainly it makes sense for UC Riverside to pursue this.

The structure of your proposed program closely resembles the one at Berkeley in most respects. The core curriculum and duration of the program are similar, as are the plans for funding students and administration. It appears to me that the critical mass of faculty is already present at Riverside. Your plan strikes me as realistic and well thought out. At this time, I have no improvements or changes to suggest, since you seem to have thought of everything. Should your program be approved, as it deserves to be, I would be happy to consult in the future if there is any input I could provide that would be useful.

In conclusion, I strongly support your proposal and wish you the best of luck with it.

Yours,

James H. Hurley
Judy C. Webb Chair
Professor of Biochemistry, Biophysics and Structural Biology
Chair, Graduate Group in Biophysics
PROFESSOR Russ Hille  
Distinguished Professor of Biochemistry  
University of California Riverside

RE: PROPOSED BIOPHYSICS PROGRAM AT UCR

Dear Dr. Hille,

I congratulate you on assembling a motivated group of faculty to organize and participate in a new graduate program in Biophysics. As described in your proposal, there is a growing demand for life science investigators that have a strong quantitative foundation in math, chemistry and physics. Your proposed program in Biophysics meets this need by assembling an interdisciplinary team of faculty that offer students training on the cutting-edge developments in biophysical tools and theory.

Since its inception in 1961, the Biophysics program has at UC Davis has enjoyed a long run of graduating outstanding students, the vast majority with the PhD degree. We are now considering adding a M.S. plan similar to your Plan II. Having a well-defined Masters option from the outset is an excellent idea and will help justify and motivate faculty to develop new courses.

Although the interdisciplinary nature of biophysics brings together an exciting mix of faculty and students from across the campus, it can present a challenge in terms of institutional support compared to programs that align with a single department or college. Thus depending on the structure for graduate student support at UCR, formulating some commitments of support from the home colleges/schools of participating faculty would be very helpful by solidifying a shared ownership of the program. For example, the lack of a home department/college for Biophysics at UCD severely limits our student access to TA positions within the undergraduate curriculum. This challenge has pushed us to be conservative in our number of admits each year, as without TA positions we do not have mechanisms to support students in cases where the major advisor has a gap in funding.

Your proposed curriculum comprehensively covers the major and emerging areas of biophysics with rigor and quality faculty. In addition, your identified course list with example tracks is especially important for recruiting students.
The size and expertise of the faculty is adequate to administer the program. I expect the program to grow in faculty numbers with increased recognition of the unique students within the program.

Yours sincerely,

John Voss, Professor and Chair
Biophysics Graduate Group
University of California Davis
jcvoss@ucdavis.edu
Appendix IV. Letters from CNAS Dean’s office

Kathryn Uhrich, Dean, College of Natural and Agricultural Sciences  (10/7/2016)

Kathryn Uhrich, Dean, College of Natural and Agricultural Sciences  (8/3/2017)
Umar Mohideen, Divisional Dean for Physical Sciences and Mathematics
Frances Sladek, Divisional Dean for the Life Sciences
To: Kevin Esterling, Interim Dean, Graduate Division

From: Kathryn Uhrich, Dean, CNAS

Date: October 7, 2016

Re: Interdepartmental Graduate Program in Biophysics.

I write to endorse the proposal for an interdepartmental graduate program in Biophysics. This proposal is fully aligned with the College’s and campus’s strategic goals of increasing its research portfolio, particularly in biomedically relevant areas. UCR is unique in having all the applied and fundamental sciences under a single administrative umbrella, but owing to the various departmental missions, disciplinary strengths in the biological sciences has been scattered among many separate departments, most of which operate their own graduate programs. As a consequence, we have often lacked a unified approach to graduate education in fundamental areas of biological sciences that fully utilizes all of our faculty strengths.

The program envisioned in this proposal will provide much needed unity and integration in the vital area of biophysics, and I enthusiastically endorse its creation.
August 3, 2017

Distinguished Professor Russ Hille
Department of Biochemistry
University of California
Riverside CA, 92521

RE: UCR Senate comments on the proposed Interdepartmental Graduate Program in Biophysics

Dear Russ,

We have reviewed the comments and recommendations on the proposed Graduate Program in Biophysics from the UCR Senate committees on Planning & Budget, Library and Information, and Graduate Council.

We note the extremely positive endorsement that each committee provided for the new Biophysics Graduate Program. Nonetheless, two of these committees raised some concerns about issues related to budget, course schedule, TA allocations, and diversity which we address here:

Director stipend: Stipends for directors of CNAS Interdepartmental Graduate Programs are provided by CNAS. As we do for departmental chair positions, we are intent on providing, within our budgetary constraints, stipends that at least partially compensate our college leaders for their effort and time.

Program funding: We recognize that our interdepartmental graduate programs need to be placed on more substantial financial footing: this has been the subject of discussions between ourselves and former Dean Childers for several years. These discussions are ongoing and now, with the new campus-wide funding plan in place, we are in a more informed position to work with Graduate Division to formulate a plan for their stability and growth. That being said, we do not believe that this new interdepartmental graduate program should be delayed pending these discussions. Graduate training in biophysics on our campus is long overdue, especially as the field is undergoing something of a renaissance. Furthermore, the establishment of yet another interdepartmental graduate program in CNAS will act as a catalyst for the new financial planning that all our interdepartmental graduate programs require.

TA allocations: The question of TA allocations to this new program is an inevitable part of the planning process. We note that CNAS already has extensive experience in assigning TAs from both departmentally based and interdepartmental graduate programs in the life sciences through the TA Allocation Committee (TAAC) established by Divisional Dean Walling in the 2000s. TAAC has functioned extraordinarily well for more than a decade and so offers a model for how TAs may be assigned to graduate students in the Biophysics program.

Faculty diversity: We completely agree with Graduate Council’s recommendation that more attention be paid to diversity among the faculty and cooperating faculty of the program. At the same time, we appreciate the efforts that you have made to diversify the faculty and the challenges that one faces in the field of biophysics. Faculty diversity is something that the graduate program and the college will maintain as a top priority.
Please let us know how we can be of further assistance in establishing this important graduate program on campus. We thank you for your leadership and care in shepherding this proposal through the various campus and Senate committees.

Sincerely,

Kathryn E. Uhrich
Dean
College of Natural & Agricultural Sciences

Frances M. Sladek
Divisional Dean of Life Sciences

Umar Mohideen
Divisional Dean of Physical & Mathematical Sciences
October 26, 2016

To: Kevin Esterling  
   Interim Dean of the Graduate Division

From: Ward Beyermann, Executive Committee  
   College of Natural and Agricultural Science

Re: Review of the Proposal for Interdepartmental Program for Graduate Studies in Biophysics

The CNAS Executive Committee discussed the Proposal for an Interdepartmental Program for Graduate Studies in Biophysics at their October 25th meeting and approved of the program.

Yours sincerely,  
Ward Beyermann, Chair  
CNAS Executive Committee
Course catalog descriptions of proposed core courses

**BCH 184** Topics in Physical Biochemistry (4 units) Lecture, 3 hr; discussion, 1 hr. Prerequisite(s): BCH 100 with a grade of “C-” or better or BCH 110A with a grade of “c-” or better; BIEN 135 with a grade of “C-” or better, or CHEM 109 with a grade of “C-” or better or CHEM 110A with a grade of “C-” or better; or consent of instructor. Explores modern biophysical method determining the structures of biological macromolecules and relating structure to function. Coers X-ray crystallography, NMR, and cryoelectron microscopy. Addresses imaging and mass spectrometry for determining structure and ultraviolet, visible, infrared Raman, fluorescence, NMR, EPR and other forms of spectroscopy for relating macromolecular structure to function.

**BIOL 203** Cellular Biophysics (3 units) Lecture, 3 hrs. Prerequisite(s): BIOL 200/MCDB 200; BIOL 201/CMDB 201; CHEM 109 or equivalent; or consent of instructor. Biophysical principles that determine cellular structure and function, including diffusion, electrochemical gradients, transport, macromolecular interactions, and genetic recombination. Illustrative examples are used to highlight the importance of these principles in modern cell biology and physiology.

**PHYS 246** Biological Physics (4 units) Lecture, 3 hr; Discussion, 1 hr. Prerequisite(s): PHYS 134 or consent of instructor. Introduces topics at the interface of physics and biology: cell physiology, probability and information, diffusion, random walks, electrostatics, elasticity of biopolymers and membranes, DNA topology, friction in fluids, and low Reynolds numbers. May be taken Satisfactory (S) or No Credit (NC) with consent of instructor and graduate advisor.
Professors: Richard Debus, Jikui Song, and Li Fan
TA: Matthew Harter (mhart005@ucr.edu)
(Office Hours: Thursdays, 10:00 AM to noon in Boyce Hall 5487)
Discussion Sections: Meets on Mondays or Tuesdays

Section 1  Instructor: Prof. Richard Debus (richard.debus@ucr.edu)
Office Hours: Monday, 1:30 to 3:30 PM in room 2446A Boyce Hall

January 4  Quantum Chemistry
January 6  Atoms & Molecules
January 8  Centrifugation
January 11  Mass Spectrometry
January 13  Introduction to Spectroscopy; Vibrational Spectroscopy 1
January 15  Vibrational Spectroscopy 2
January 18  Holiday (no lecture)
January 20  UV/Vis spectroscopy; CD spectroscopy
January 22  Fluorescence Spectroscopy 1
January 25  Fluorescence Spectroscopy 2
January 27  EPR spectroscopy 1
January 29  EPR spectroscopy 2; Double Resonance methods
February 1  Exam 1 (in classroom): 150 points

Section 2  Instructor: Prof. Jikui Song
Office hours: TBA

Feb. 3  Introduction and Basic Concepts
Feb. 5  Basic Concepts and 1D NMR Spectroscopy
Feb. 8  Spin-Spin Coupling and Nuclear Overhauser Effect
Feb. 10  Pulse Sequences, NMR Relaxation
Feb. 12  2D 1H NMR Spectroscopy
Feb. 15  Holiday
Feb. 17  Multi-dimensional Heteronuclear NMR
Feb. 19  Chemical Shift and Protein Structure Analysis
Feb. 22  NMR Structure Determination and Course Overview
Feb. 24  Exam 2 (in classroom): 100 points covering section 2

Section 3  Instructor: Prof. Li Fan
Office Hours: TBA

February 26  X-ray Crystallography #1 – Overview and Protein Crystals
(Assigned Reading: Rhodes, Chapters 1-3)
Feb. 29  X-ray Crystallography #2 – Principles of X-ray Diffraction I
(Assigned Reading: Rhodes, Chapter 4)
March 2  X-ray Crystallography #3 – Principles of X-ray Diffraction II
(Assigned Reading: Rhodes, Chapter 4)
March 4  X-ray Crystallography #4 – From diffraction to electron density
(Assigned Reading: Rhodes, Chapters 2 & 5)
March 7  X-ray Crystallography #5 – Estimation of Phases – Molecular Replacement
(Assigned Reading: Rhodes, Chapter 6)
March 9  X-ray Crystallography #6 – Estimation of Phases – Experimental Methods
(Assigned Reading: Rhodes, Chapter 4 & 6)
March 11  X-ray Crystallography #7 – Structural Refinement & Judging the Molecular Model
(Assigned Reading: Rhodes, Chapter 7-8)
March 17  Final Exam (11:30-1:00): 100 points covering Section 3
### Biology 203
**Cellular Biophysics and Physiology**  
Rich Cardullo, Department of Biology

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
<th>Assignment Due</th>
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<tr>
<td>9/27 – 10/1</td>
<td>Probability Theory/Sex Distribution in Families</td>
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<tr>
<td>10/4 – 10/8</td>
<td>Average charge on a macromolecule</td>
<td>HW 1 due 10/8</td>
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<tr>
<td>10/11 – 10/15</td>
<td>The random walk/protein folding</td>
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<tr>
<td>10/18 – 10/22</td>
<td>Diffusion modeling</td>
<td>HW 2 due 10/22</td>
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<td>10/25 – 10/29</td>
<td>Transport across membranes</td>
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<tr>
<td>11/1-11/5</td>
<td>Filtration</td>
<td>HW 3 due 11/5</td>
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<tr>
<td>11/8 – 11/12</td>
<td>Poisson Processes</td>
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<tr>
<td>11/15 – 11/19</td>
<td>The Luria-Delbrück Experiment</td>
<td>HW 5 due 11/19</td>
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<tr>
<td>11/22 – 11/26</td>
<td>The photon detection limit of the eye</td>
<td></td>
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<tr>
<td>11/29 – 12/3</td>
<td>Special Topics</td>
<td>HW due 12/3</td>
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**Final Exam:** December 6, 2004 from 8 a.m. – 11 a.m. in Spieth 1239.

**Grading:** Homework is worth 75%, Final is worth 25%.
Physics 246
Biological Physics

Instructor
Roya Zandi
Office: 3026 Physics Building
Office hours: 2:00-3:00 Thursdays, or by appointment.
Email: roya.zandi@ucr.edu

Class meetings
Tuesdays /Thursdays, 9:40-11:00 pm
Location: ENGR2 141

Course Description
Single-molecule studies of macromolecules now allow tests of the conceptual foundations of statistical mechanics. The class provides a review of the physical and mathematical foundations of equilibrium and non-equilibrium statistical mechanics with emphasize on selected "hot topics" that lie at the interface of physics and biology.

Prerequisites
Statistical Mechanics (134)

Textbook

We are using Nelson as the basic structure, but I will probably expand on some topics and introduce some other new ones.

There are many excellent resources on the web. Here are a few examples;

ITP Program on Bioinformatics: http://matisse.ucsd.edu/itp-bioinfo/

A course by Prof. Goldenfeld on Statistical Physics of Biological Information and Complexity:http://guava.physics.uiuc.edu/%7Enigel/courses/498BIO/

A course at Berkeley on Molecular Biophysics: http://alice.berkeley.edu/biophysics/
Tentative outline

1) Probability and Information
2) RNA, DNA, and proteins
3) Random Walks, Friction, and Diffusion
4) Brownian Motion, the Einstein relation, and the Fokker-Planck Equation
5) Langevin Equation and the Fluctuation Dissipation Theorems.
6) Non-equilibrium Thermodynamics, the Onsager Reciprocity Relations and Entropy Production.
7) Polymer Theory: Softening of rigidity by fluctuations, Entropy and Markov chains, Flory theory, Worm-like chain model
8) Electrostatics: Macro-ions, counter-ions, pH, Poisson-Boltzmann equation, Debye equation
9) DNA Topology (Link, Twist, and Writhe).

Assignments

The homework assignments are an important part of this course, and the overall average homework score will count for 60% of the final grade. You may consult with classmates in "study groups," as long as you write out your own answers.

Problem sets should be turned in at the beginning of class on the due date. No problem sets will be accepted after the solutions have been posted. Problem sets handed in after the deadline but before the solutions have been posted are subject to a 50% grade penalty.

A Final Project will count for 40% of the final grade.

Final project: An in-class presentation on a topic of your choice. The presentation will be about 30 minutes and can cover any topic at the interface of biology and physics. You’ll need to discuss your topic with me in advance.
APPENDIX VII. Catalog Descriptions of Elective Courses

**BCH 186** Topics in Molecular Bioenergetics (3) Lecture, 3 hours. Prerequisite(s): BCH 100 with a grade of “C-” or better or BCH 110B with a grade of “C-” or better; BCH 184 with a grade of “C-” or better; or consent of instructor. Introduction to biological energy transduction. Describes the coupling of oxidative phosphorylation and photosynthesis to adenosine triphosphate (ATP) synthesis and the coupling of ATP hydrolysis to ion transport, chemotaxis, molecular motors, biomimetics, and other biological processes on the basis of recent structural and mechanistic studies of the protein complexes involved.

**BCH 187** Fundamentals of Enzymology, 3 units, Lecture, 3 hours. Prerequisite(s): BCH 100 or BCH 110A with a grade of C- or better. An introduction to the fundamental principles of enzymology. Specific topics include, acid-base catalysis, strain effects, transition state theory, enzyme kinetics (including isotope effects), enzyme dynamics and enzyme regulation. Considers in detail the reactions of several representative enzymes.

**BCH 210** Biochemistry of Macromolecules, 4 units, Lecture, 4 hours. Prerequisite(s): BCH 110A, BCH 110B, BCH 110C or equivalents; BCH 184 (may be taken concurrently); CHEM 109; graduate standing or consent of instructor. Discussion of recent advances in the knowledge of the molecular architecture of proteins and nucleic acids, especially with respect to new experimental approaches for analyzing their structure and function. Chemistry of the active site of enzymes.

**BCH 230F** Advanced Topics in Biochemistry (2) Lecture, 1 hour; discussion, 1 hour. Prerequisite(s): BCH 100 or both BCH 110A and BCH 110B or consent of instructor. Addresses advances in enzymology by analysis of the recent literature.

**BIEN 135** Biophysics and Biothermodynamics, 4 units, Lecture, 3 hours; discussion, 1 hour. Prerequisite(s): BIEN 101, MATH 10B, MATH 046, PHYS 040C. An introduction to the application of thermodynamic principles to understanding the behavior of biological systems. Discusses biophysical properties of biomacromolecules such as proteins, polynucleotides, carbohydrates, and lipids, as well as the methods of characterizing their properties and interactions.

**BIEN 142** Introductory Biomedical Optical Imaging, 4 units, Lecture, 3 hours; discussion, 1 hour. Prerequisite(s): PHYS 040C and MATH 010B; or consent of instructor. Examines fundamental theory and basic design of biomedical optical imaging systems. Topics include a basic understanding of the working principles of optical components, diagnostic light-tissue interaction, and design of imaging systems to exploit the interaction of light with biological phenomena.

**BIEN 160** Biomedical Imaging, 4 units, Lecture, 3 hours; discussion, 1 hour. Prerequisite(s): BIEN 120. An introduction to the fundamental physics and engineering principles for medical imaging systems. Covers X-ray, ultrasound, radionuclide, magnetic resonance imaging, positron emission tomography, optical coherent tomography, and other optical methods. Includes image formation and reconstruction, image characteristics, and quality and image processing.

**BIEN 165** Biomolecular Engineering, 4 units, Lecture, 2 hours; discussion, 1 hour; term paper, 3 hours. Prerequisite(s): BIEN 135, or consent of instructor. Emphasizes engineering, biochemical, and biophysical concepts and technologies intrinsic to specific topics of biomolecular engineering. Introduces the history of genetic and protein engineering. Topics include biological thermodynamics, molecular kinetics, biochemical and biophysical approaches, protein engineering, high-throughput screening technologies, and protein engineering with unnatural amino acids.

**BIEN 242** Advanced Biomedical Optical Imaging, 4 units, Lecture, 3 hours; discussion, 1 hour. Prerequisite(s): BIEN 142 or equivalent; graduate standing or consent of instructor. Examines advanced theory and optimized design of biomedical optical imaging systems. Topics include a full understanding of the working principles of optical components, diagnostic light-tissue interaction, and design of imaging systems.
systems to exploit the interaction of light with biological phenomena. May be taken Satisfactory (S) or No Credit (NC) with consent of instructor and graduate advisor.

**BIEN 245** Optical Methods in Biology, Chemistry, and Engineering, 4 units, Lecture, 3 hours; discussion, 1 hour. Prerequisite(s): CHEM 109 or equivalent; graduate standing; consent of instructor. Covers the origin of fluorescence and other emission processes that modulate the characteristics of molecular emissions. Presents emission-based analytical and bioanalytical methods and techniques. Reviews state-of-the-art instrumentation, including their applicability, limitations, and source. Also provides interpretation and meaning of the measured signals as applied to biological systems. May be taken Satisfactory (S) or No Credit (NC) with consent of instructor and graduate advisor. Course is repeatable as content changes. Cross-listed with MSE 226.

**BIEN 249** Integration of Computational and Experimental Biology, 4 units, Lecture, 3 hours; laboratory, 3 hours. Prerequisite(s): BIOL 005B; MATH 010B, MATH 046, PHYS 040C; graduate standing. A multidisciplinary introduction to computational methods used to analyze experimental biological data. Introduction to mathematical concepts needed to understand protein structure and dynamics, protein-protein interactions (structures and networks), gene regulatory networks, signal transduction networks, metabolic networks, and kinetic modeling of cellular processes. Also covers techniques used to derive experimental data. May be taken Satisfactory (S) or No Credit (NC) with consent of instructor and graduate advisor. Cross-listed with CEE 249.

**BIEN 251** Biophotonics: Optical Microscopy and Its Biological Applications, 3 units, Lecture, 2 hours; discussion, 1 hour. Prerequisite(s): graduate standing or consent of instructor. Examines the fundamentals of optical system design and system integration in light microscopy. Covers design components, including light sources, lenses, mirrors, dispersion elements, optical fibers, and detectors. Also covers optical system analysis, transfer functions, magnification, resolution, contrast, and molecular, cellular, organ, and organism applications.

**CHEM 201A** Advanced Physical Chemistry: Quantum Mechanics (3) Lecture, 3 hours. Prerequisite(s): CHEM 113 with a grade of “C” or better. Covers concepts in quantum mechanics including wavepackets, uncertainty, single particles in multiple dimensions, and approximate methods for solving the Schroedinger equation.

**CHEM 201B** Advanced Physical Chemistry: Quantum Mechanics and Spectroscopy (3) Lecture, 3 hours. Prerequisite(s): CHEM 113 with a grade of “C” or better. Covers concepts in quantum mechanics with particular applications to spectroscopy.

**CHEM 201C** Advanced Physical Chemistry: Elementary Statistical Mechanics (3) Lecture, 3 hours. Prerequisite(s): CHEM 110A and CHEM 110B with grades of “C” or better. Covers concepts in elementary statistical mechanics including ensembles, interpretations of thermodynamic functions, and quantum statistics.

**CHEM 201D** Advanced Physical Chemistry: Thermodynamics (3) Lecture, 3 hours. Prerequisite(s): CHEM 110A and CHEM 110B with grades of “C” or better. Covers concepts in thermodynamics including fundamental equations, potentials, Maxwell relations, and stability criteria. Cross-listed with MSE 205.

**CHEM 201E** Advanced Physical Chemistry: Kinetics (3) Lecture, 3 hours. Prerequisite(s): CHEM 110A and CHEM 110B with grades of “C” or better. Covers concepts in kinetics including reaction mechanisms and the molecular interpretation of reaction dynamics.

**CHEM 206A** Introduction to Computational Quantum Chemistry (3) Lecture, 3 hours. Prerequisite(s): CHEM 113 or equivalent, graduate standing; or consent of instructor. Introduces computational techniques in quantum chemistry. Includes Hartree-Fock theory, Density Functional Theory, and
electron correlation methods. Emphasizes practical applications in a research setting. Cross-listed with MSE 225C.

**CHEM 206B** Modeling Chemical and Biochemical Molecules (3) Lecture, 3 hours. Prerequisite(s): graduate standing in Chemistry or a related field or consent of instructor. Introduces students to the principles, concepts, and techniques for modeling chemical and biological systems. Covers the various methods and techniques for molecular simulations, energy calculations, obtaining initial data, accessing data reliably, visualization and analysis of molecules, and screening and designing chemicals for proteins.

**CHEM 209** (E-Z) Advanced Topics in Physical Chemistry (2-3) lecture, 2 hours (2 units) or 3 hours (3 units). Prerequisite(s): consent of instructor. Additional prerequisites are required for some segments of this course; see department. Selected advanced topics from modern physical chemistry.

**CHEM 211D** Spectrometry in Organic Structure Analysis (3) Lecture, 3 hours. Prerequisite(s): graduate standing or consent of instructor. Utilizes modern spectroscopic techniques such as IR, mass spectrometry, and 1H and 13C NMR to determine the structure of complex organic molecules. Topics include advanced NMR techniques such as 2D NMR, NMR pulse sequences, diffusion NMR, and MRI. Cross-listed with MSE 225A.

**CHEM 229G** Advanced Topics in Analytical Chemistry (2 or 3) Lecture, 2-3 hours. Prerequisite(s): consent of instructor. Additional prerequisites may be required for segments of this course; see department. Selected advanced topics from modern analytical chemistry. Course content will vary.

**PHYS 145A** Biophysics, 4 units, Lecture, 3 hours; discussion, 1 hour. Prerequisite(s): CHEM 001C or CHEM 01HC; MATH 010B; MATH 046; one of the following: PHYS 002C with B- or better, PHYS 041C with a C- or better, PHYS 040E with a C- or better. Covers physical modeling of the structure of proteins; protein folding; structure of nucleic acids; electrostatic potential of DNA; dynamics of biomolecules; structure of a biological cell; osmotic pressures of cells; non-equilibrium thermodynamics; and biochemical reactions.

**PHYS 145B**. Biophysics (4) Lecture, 3 hours; discussion, 1 hour. Prerequisite(s): PHYS 145A; BCH 100 or BCH 110B; or consent of instructor. Covers conformation of biopolymers, intermolecular forces, dynamics of biopolymers, Brownian motion, biopolymers as polyelectrolytes, electrolytic solutions, and the Debye-Huckel theory.

**PHYS 145C**. Biophysics (4) Lecture, 3 hours; discussion, 1 hour. Prerequisite(s): PHYS 145B or consent of instructor. Examines stochastic thermodynamics; the Fluctuation Theorems and the Jarzynski relation; protein and RNA denaturation; tests of the Jarzynski relation; chemical forces and selfassembly; enzymes and molecular machines; survey of molecular devices found in cells; and kinetics of real enzymes and machines.

**PHYS 212A** Thermodynamics and Statistical Mechanics, 4 units, Lecture, 3 hours; discussion, 1 hour. Prerequisite(s): graduate standing; consent of instructor. Covers thermodynamics, statistical mechanics, ideal Bose systems, ideal Fermi systems, and bulk motion. Cross-listed with MSE 204.

**PHYS 212B** Thermodynamics and Statistical Mechanics, 4 units, Lecture, 3 hours; discussion, 1 hour. Prerequisite(s): MSE 204/PHYS 212A; graduate standing; consent of instructor. Addresses functional integrals and approximation techniques. Provides an introduction to phase transitions and the renormalization group.