University of Washington | College of Arts & Sciences

Academic Program Review Self-Study Document

Department of Chemistry

Bachelor of Arts
Bachelor of Science
Masters of Science
Doctor of Philosophy

August 2011

Department of Chemistry
Prof. Paul B. Hopkins, Chair
Date of Last Review: 1999-2000

Cover

Lower Left: One promising method for the conversion of solar energy to a storable fuel is the production of hydrogen gas by the splitting of water. A key step in that process is the removal of electrons from water, to form oxygen gas. Currently available catalysts for this process involve expensive metals. Goldberg, Mayer, et al. have invented a highly efficient and inexpensive copper electrocatalyst for this process. This image shows oxygen evolution by this method.

Middle: Electrooptic materials are useful for the interconversion of electrical and optical signals. One goal of the Center for Materials and Devices for Information Technology is the creation of low cost electrooptic modulators with a very low drive voltage using oriented organic chromophores. This image shows the results of a simulation of the orientation of organic electrooptic chromophores (the electrostatic surfaces of which are represented by colors) at low and high number density.

Upper Right: The lysosomal storage diseases are a family of genetic diseases with catastrophic consequences for the carriers and for which practical screening methods were until recently unavailable. Gelb, Turecek, and Scott have invented a low cost multiplex assay for enzymatic activities that can be used to detect these diseases. Their method is now being adopted as a routine tool for infant screening around the world. The image shows the standard source of the blood sample used in this assay.

TABLE OF CONTENTS

LIST OF FIGURES, TABLES, AND APPENDICES

Preamble

The University of Washington reviews academic units decennially. These reviews are a rare opportunity for a unit to occupy the spotlight, to capture the attention of Deans and the Provost. The review committee's assessment of the contributions and circumstances of the unit can set the stage for the unit's next decade.

This review comes in the midst of turmoil in the world's financial markets generally and the financing of U.S. public higher education specifically. The longstanding trend of declining state funding for public higher education has accelerated dramatically during the past few years. Undergraduate tuition levels have skyrocketed. At the UW, this has resulted in tuition funds replacing state funds as the major source of intramural funding for schools and colleges. Recognizing the increasing role of tuition funds in our budget, our campus has adopted an activity based budget (ABB) system, which calls for tuition dollars to follow the students who pay them. An additional recent development is the delegation of full tuition-setting authority to the Board of Regents of the UW by our State Legislature.

If the trend of the past several decades continues, the fraction of the UW's core instructional budget derived from student tuition funds will continue to rise during the coming decade. Under the ABB system, tens of millions of dollars of new funds will become available to invest in improvements in undergraduate education. How will the UW choose to invest these funds?

We ask the review committee to consider whether a significant increase in the budget for Chemistry is needed to elevate the quality of undergraduate education we are able to provide. We present data showing that our instructional budget is *very* low relative to off campus peers, with the primary consequence that we are critically short-staffed in both faculty members and teaching assistants. This in turn impacts class sizes, instructional quality, and the breadth of our course offerings. Our particular circumstances derive more from the unusually large growth in our instructional programs (both undergraduate and graduate) across several decades than from budget cuts, but both have contributed.

Anecdotal evidence suggests that the weak undergraduate instructional budget in UW Chemistry may be the norm, not the exception, at this institution for units that carry a substantial undergraduate instructional role. A strong endorsement of Chemistry's plan to invest in undergraduates could spark a broader conversation concerning whether the UW has invested sufficiently in undergraduate education, and promote the investment of new undergraduate tuition funds in units that directly deliver undergraduate education. Absent such a message, pressure will be high to direct new funds, derived from undergraduate tuitions, to many other areas, including administration, research, and less heavily subscribed instructional programs. We believe a strong message from our review committee could have broad and positive consequences for the quality of undergraduate education at the UW.

Though we have chosen to emphasize in this message the need for investment in undergraduate education, we would be remiss not to reprise a central theme of our review from 1999: chemistry is the central science. Our Department's role is not limited to providing foundational undergraduate science instruction. Our graduate and research programs also provide the underpinning for future advances in intellectually exciting and societally critical areas.

Many faculty and staff members participated in the preparation of this document. Large sections were written by Professors Hopkins, Reid, and Synovec in their roles as Chair and Associate Chairs, respectively. Other contributors include Professors Chiu, Gamelin, Gelb, Ginger, and Goldberg. Gary Pedersen and Kimberly Quigley assembled data and prepared figures, tables, and appendices. An advanced draft of the document was circulated to the entire faculty and selected staff members for comment; many responded with helpful suggestions. The Chair assumes responsibility for errors.

We thank the review committee in advance for their work.

A Vision for the Department of Chemistry in 2020

Our research and instructional programs will be comparable in quality to the very best at leading U.S. public research intensive institutions. In due course, these programs will be recognized nationally and internationally as such.

The achievements of our students and postdoctoral associates will be limited only by their individual potential. They will compete favorably for subsequent study or employment in the academy, industry, or government.

Our research programs will advance the frontiers of knowledge, and address societally critical needs, particularly in the areas of biological chemistry, catalysis and sustainability, and materials chemistry. We will be recognized as key research collaborators by many units at the UW.

We will be a community of faculty, staff, and students with diversity as a core value. The face of our department will reflect the face of America.

Our budget will be sufficient in size to allow us to admit all academically qualified undergraduate students at the UW wishing to study toward our bachelor's degrees, to admit and support graduate students sufficient in number to maintain critical mass in our research programs, and to support the infrastructure of equipment and spaces required for modern instruction and research in the chemical sciences.

In this intellectually vibrant and welcoming environment, faculty, staff, and students will view study or a career in the Department of Chemistry at the UW as a highly attractive choice.

Achieving the Vision

We seek endorsement of proposed enhancements to our instructional and research programs that are critical to achieving our vision. Increased investment in faculty and teaching assistants will assure students increased access to our courses, expanded breadth of course offerings, reduced class sizes, higher quality learning experiences, and increased availability of opportunities to participate in research. The required resource investments are matched in scale to anticipated marginal tuition revenues, and are the right investment of incremental funds generated predominantly by undergraduate student tuitions.

Executive Summary

The Department of Chemistry has completed an extraordinarily successful decade. Our undergraduate service teaching and degree programs have exploded in size; we now grant more bachelor's degrees annually (about 350) than any other chemistry department in the nation. Our top bachelor's students are winning prestigious local and national awards. Our graduate program expanded in size from about 150 a decade ago to about 200, and is presently producing one quarter of all doctoral degrees being awarded by science units within the College of Arts and Sciences. By more than doubling our grant and contract funding, we rose to join the top ten chemistry departments nationally by the measure of annual federal research expenditures, placing us among the top science and engineering units at the UW by the measure of total research expenditures annually ($23.5M). During the decade, the Department established two new NSF-funded centers. In addition to the fundamental contributions one expects from a premier chemistry department, our discoveries are impacting human lives: For example, a screening program for genetic diseases developed by UW Chemistry investigators is today being adopted for universal newborn screening around the world.

During the coming decade, we aspire to continue to improve our programs. Our vision is to be among the top few chemistry departments at U.S. public research institutions. We envision a diverse environment that welcomes all qualified undergraduate students wishing to study biochemistry or chemistry, and in which all students and postdoctoral associates are limited only by their individual potential. We will continue to advance the frontiers of knowledge, addressing societally critical needs, particularly in the areas of biological chemistry, catalysis and sustainability, and materials chemistry.

Critical to achieving our vision is a very significant improvement in the centrally provided resource base that supports our instructional programs. Despite the tremendous advances in the quantity and quality of our programs during the past decade, our intramural resource base of support has eroded significantly. From a high point of nearly 42 FTE of tenure line faculty in 2004, our faculty count has now dwindled to under 33 FTE. Where a decade ago we employed about 100 graduate teaching assistants during the academic year, and the previous review committee recommended a significant expansion of this number, we can now support just 80. The great success of our instructional and research programs is all the more impressive in the face of these cuts.

We provide data comparing our personnel counts, budgets, etc. to those at six off-campus peer chemistry departments that annually deliver a similar number of student credit hours (but far fewer undergraduate degrees) at public research intensive institutions. These data clearly show that the UW Chemistry faculty, TA and, staff FTE counts are all low, a consequence of an annual budget that is some $2M lower annually than the off-campus peers. Some of the shortfall is a consequence of recent budget cuts, but most of the problem results from growth of our instructional programs unmatched by increased resources.

The negative consequences for undergraduate and graduate students of the shortfall in faculty and TA count are profound. During this decade we have sought to meet rising student demand with declining instructional staffing by reluctantly allowing core class sizes to grow, increasing student:TA ratios in quiz and laboratory sections, reducing laboratory experiences, cutting virtually all undergraduate elective courses and reducing the number of graduate courses we offer. Despite these circumstances, students continue to indicate satisfaction with our courses and degree programs overall.

We propose a program of investments that will elevate the quality of our undergraduate program to off-campus peer levels and beyond. To be sure, the primary justification for the new investment is the scale of the undergraduate program, but the positive impact will also result in an improved experience for both graduate students and faculty. Specifically, we propose expansion of the tenure track faculty from the current 33 to 40, the lecturer count from one to five, and the TA count from the 80 to 120 (the low end of the peer range). We believe that these investments are critical if we hope to lock in the gains of the past decade, and set the stage for an extraordinarily bright future.

Chapter I
Introduction and Overview

Presidential Executive Order Number 20 in the University Handbook calls for all academic units of the University of Washington to be reviewed on a ten-year cycle. The order states that the outcome of these reviews should enhance understanding of the reviewed units':

- "Quality of instruction, research, and public service;
- Value to students' general education and preparation for society;
- Role within the University and effectiveness in fulfilling that role;
- Resource requirements;
- Future objectives and changes necessary to achieve them."

This document is a self-study of the Department of Chemistry, one of some fifty units in the College of Arts and Sciences. We summarize the status and accomplishments of this unit since the last review (1999-2000). In preparation for this review, our faculty met during the course of the 2010-11 academic year in a series of nine workshops at which we discussed our undergraduate and graduate programs, future research directions, faculty hiring process, departmental governance, the Department's centrally provided budget, and the proposed future investments described herein. These workshops, which built community and led to self-discovery, guided the preparation of the self-study, which is organized as follows:

Chapter I provides an overview of the Department, describing the nature and scale of our missions, how we are organized, and the human, physical, and financial resources available to us. A comparison is made to the resource bases at six off-campus peer departments of chemistry whose programs are of similar quality and scale. The inescapable conclusion is that our resource base is mismatched (too small!) to the mission, particularly the undergraduate instructional program. The consequences of the budgetary shortfall are elaborated in subsequent chapters.

Chapter II describes our undergraduate degree program in greater detail. The undergraduate program has grown substantially during the last ten years, as it did the decade before. Over the past two decades, annual undergraduate student credit hours (SCH) grew by over 50% and the number of bachelor's degrees produced annually grew seven-fold from just over 50 to about 350. Growth rates of this magnitude are in no way characteristic of UW undergraduate programs on average. During the same period, our teaching assistant count grew very slightly (from 67 during the academic year to 80) and the tenure line faculty count decreased. The combination of a rapidly growing program and declining resource base required us to make a variety of changes in our program, most with negative consequences. We describe here what would be necessary to restore our core instructional competency and pursue opportunities that will dramatically improve the undergraduate program.

Chapter III describes our graduate program. A bright spot during the past decade was the very significant expansion of the graduate program, from a program that was in scale below critical mass (about 150 to 170 students, small by national standards) at the time of the last ten year review to a program that was comparable in scale to all but the very best (and not coincidentally largest) top-quartile chemistry graduate programs nationally (220-240). Unfortunately, the "great recession" has forced us to scale the graduate program back to about 200. The current enrollment of 6 students per tenure-line faculty member is somewhat below the level at top public institutions. We describe opportunities to improve this program.

Chapter IV is devoted to a summary of the faculty of the Department: who we are, how this has changed in the past decade, how we organize ourselves, and how we renew our numbers through hiring. A flavor of our current and planned future research initiatives is provided. Despite an aggressive program of hiring, our tenure-line faculty count has fallen significantly, from nearly 42 FTE in 2004 to under 33 FTE presently. We propose to rebuild to 40 FTE, and to build further excellence in the areas of biological chemistry, catalysis and sustainability, and materials chemistry.

Chapter V contains a summary of our vision (see page iv). Given the scale of our undergraduate instructional mission, achieving this vision will be possible *only* if the institution aligns the scale of our resource base more closely with the scale of our undergraduate instructional program.

Reviewers may find the Department of Chemistry website (http://depts.washington.edu/chem/) to be a useful adjunct to this Self Study and the Appendices.

A. Mission

Our mission, simply stated, is education and discovery in the chemical sciences. Our faculty members, assisted by our staff, pursue this mission in collaboration with undergraduate students, graduate students, postdoctoral associates, and visitors.

1. Undergraduate Education

The Department of Chemistry offers four undergraduate degrees: the Bachelor of Arts in Chemistry, Bachelor of Science in Chemistry, Bachelor of Arts in Biochemistry, and Bachelor of Science in Biochemistry. The latter two degrees are offered jointly with the Department of Biochemistry, a unit in the School of Medicine. The requirements for all of our degrees are described in Chapter II and the associated appendices and may be found at the Department web site.

The Chemistry undergraduate program is among the largest at the University of Washington by measures such as total student credit hours (SCH) or undergraduate degrees awarded annually. By the latter measure, according to the ACS ours is by far the largest program in the nation, now granting about 350 bachelor's degrees annually! Our students range from those who take just one or a few chemistry courses to acquire an awareness of our discipline, to undergraduates from other science or engineering programs requiring a deeper theoretical and practical education in chemistry, to our majors, many of whom will serve the nation's biochemical or chemical industry, continue in graduate or professional school, or serve in our educational system. Chemistry offers the largest instructional laboratory program at the UW, with about 9000 one-quarter enrollments each academic year in courses that include a laboratory component. Some 3000 students take one or more of our 100-level lecture and laboratory courses each academic year; another 1000 stay on for 200 level (organic) coursework. Some 1400 undergraduate students are declared majors in chemistry or biochemistry. At the time of our last ten year review, about 150 undergraduates earned a bachelor's degree annually; by that measure we have more than doubled in size in a decade. Needless to say, the number of faculty, teaching assistants, and staff has not grown commensurately. In fact, our faculty and TA counts are today *smaller* than a decade ago. The dominant theme of this self-study will be the request to bring the sizes of our faculty, staff, graduate program, and undergraduate program to a healthy balance.

2. Graduate Education

A second role for the Department is the provision of graduate education. We offer two postgraduate degrees, the Masters in Chemistry and the Doctor of Philosophy in Chemistry. Virtually all entering graduate students seek the latter degree. The 30 to 40 Ph.D. degrees we award annually constitute about one-quarter of all such degrees generated by the science units within the College of Arts and Sciences. Since the last 10 Year Review, our graduate program experienced a period of extraordinary growth and success, rising from about 150 (Fall count) to nearly 240. We have recently

been forced to downsize the program to about 200, smaller than the top-ranked public programs nationally. Our graduate students are the primary source of teaching assistants for our undergraduate program, and thus the quality of the graduate program directly impacts the quality of our undergraduate program. Our Ph.D. graduates seek and find employment appropriate to their education, predominantly in the nation's industrial work force, but also in four year colleges and research universities. Our graduate program is typically ranked in the second decile from the top (80^{th} to 90^{th} percentile; NRC, US News) of the some 180 Ph.D.-granting chemistry programs in the U.S. Our reputational ranking in some sub-areas is in the top decile. By the measure of federal expenditures for research, the primary source of support for our graduate students, we have in recent years ranked in the top decile. Our graduate program has been damaged by the financial downturn, with the diminished faculty count and TA budget, both down by about $1/5^{th}$, requiring us to downsize the graduate program for financial reasons. Uncorrected, the latter will negatively impact our research productivity, and in due course damage the perceived quality and ranking of our graduate program, and in turn the undergraduate program.

3. Research

A third role for the Department is the discovery and integration of knowledge through research. This mission is inextricably linked to the graduate program, and is assisted by postdoctoral research associates and the research faculty. Historical divisions between the sub-disciplines of our field have continued to dissolve during the past decade. The traditional sub-disciplines survive primarily as rubrics for the undergraduate core curriculum, and are not particularly useful for describing the many ways faculty members organize themselves as they pursue research. Our extramural research budget is now about $23.5M annually (including indirect costs), including two large NSF-funded centers, and comparable to all but the top few chemistry departments nationally. The tenure-line faculty members are the drivers of our research agenda. With a tenure-line faculty count of under 33 (and a very large undergraduate instructional mission), this review finds our research program at risk.

B. Organizational Structure

The Department of Chemistry is one of some fifty academic units in the College of Arts and Sciences, which itself is divided into four divisions. The Natural Science Division, comprised of five larger units (Biology, Chemistry, Mathematics, Physics, Psychology) and four smaller units (Applied Mathematics, Astronomy, Speech and Hearing Sciences, Statistics), is led by a Divisional Dean (Werner Stuetzle), who reports to the Dean of the College (Ana Mari Cauce). The Department of Chemistry is led by a Department Chair (Paul Hopkins) appointed by the Dean of the College for renewable terms of up to five years. The Department Chair is assisted by two Associate Chairs, for Undergraduate Education (Philip Reid) and for Graduate Education (Robert Synovec), appointed by the Chair for unlimited terms.

The faculty of Chemistry and selected staff members do much of the administrative work of the Department through a system of committees appointed annually by the Chair (see Appendix E: Committee Membership 2010-11). Most of these committees operate informally, rarely if ever meeting face-to-face. Most decisions are made after consultation among the Department Chair, Executive Director (Mr. Gary Pedersen, Administrator and staff lead), and a committee chairperson, who in turn judges the appropriate level of consultation (perhaps by email) with members of his/her committee. The Academic Personnel Committee is an exception, operating relatively formally, meeting regularly to advise the faculty and the Chair on faculty hiring, promotion, salary, and retention considerations. A considerable merit of our informal system is efficiency: simply put, we waste little time in meetings. A demerit (identified in a workshop) can be confusion, especially among younger members (this Autumn, 11 of our 33 tenure-line faculty are Assistant Professors!) concerning who is making decisions and on what basis. And perhaps not surprisingly, the current informal system works best in “good times”;

difficult periods demand more distributed decision making, both to gather the very best ideas for change, and to ensure the broad "buy-in" needed to implement it. We believe our decision-making process is sound, but has been less transparent than it needs to be given the sea-change we have recently experienced in the membership of our faculty (discussed in Chapter IV).

Informality should not be mistaken for lack of accomplishment. Most of the committees have substantive tasks that are accomplished annually. For example, the Graduate Education Committee annually updates our promotional materials, evaluates hundreds of applicant files for admission, organizes graduate student recruiting visits, etc. Faculty search committees annually evaluate faculty applicants, coordinate interviews, etc. The Instructional Coordinators annually assign our instructors to our courses. The Laboratory Safety Committee regularly inspects every laboratory for safety violations.

It has been a long-standing tradition in Chemistry to minimize the committee work of new members (especially Assistant Professors), to allow them to focus on the research and instructional activities that are most important for their long-term career success. Promotion to the rank of Associate Professor brings a modest increase in duties. Substantive service expectations, including committee chairpersonships, are generally assigned only after promotion to full Professor. For example, the Space Committee and several recent Faculty Search Committees have been headed by relatively recently promoted Full Professors. We recognize the importance of transitioning leadership to each new generation.

The Department is ably served by a staff of some 65 FTE (about 40 of whom are funded by the centrally provided budget, and the balance by extramural funds) who support the instructional and research programs. An organizational chart is provided as Appendix A. We are extremely fortunate to have Mr. Gary Pedersen as the Executive Director of the Department and staff lead. Our staff is the largest of any unit in the College of Arts and Sciences, but is smaller in size than off-campus peer chemistry departments (see next section, Resources). The origin of the need for a large staff is the combination of the scale of our undergraduate program, being a laboratory-based science that is inherently hazardous, and the scale of our research program.

Overall, we believe our organizational structure has functioned well. With so many new faculty members in residence, the Chair, Associate Chairs, and Committee Chairs will need to reach out, particularly to new members to ensure that they understand and participate in local decision making.

C. Resources

In this section, we describe the resources we presently have to achieve our instructional and research missions, compare these resources to those of off campus peers, and briefly outline the specific enhancements to our programs that would be possible with new investments--presumably derived from rising undergraduate tuition revenues (see Preamble). The analysis relies upon Table I-A, containing primary data from the 2011 Council for Chemical Research national survey of chemistry chairs. These data summarize the resources at the six top-quartile public peer chemistry departments who participated in that survey and have a similar undergraduate program size as measured by student credit hours, though in all cases these peers produce far fewer bachelor's degrees annually. The bottom line of the table shows the percentage change needed at the UW for each measure to achieve the average of the peers by each of these metrics. A sophisticated statistical analysis is not required to conclude that the UW Chemistry budget is far too small, with the consequence that our faculty and TA counts, especially, are far below off-campus peer levels. Our success at raising research funds compared to these peers (and virtually all others nationally) is also evident.

	Professor	Assocociate	Assistant	Tenure Track Total FTE	Lecturer	Post-doctoral	PhD Degrees	PhD Students	Graduate Stipend ($K)	Bachelors Degrees	Undergraduate Majors
Michigan State	26	9	2	34.0	2	25	36	169	25.6	**47**	**520**
Ohio State	30	1	9	35.4		44	35	206	19.3	**51**	**89**
Penn State	18	7	11	36.0	6	49	46	211	24.1	**28**	**38**
Purdue Univ	32	11	8	47.5	2	56	55	322	20.8	**54**	**130**
Univ Fla	19	13	8	39.0	5	53	49	256		**133**	**172**
Univ Wisconsin	28	3	8	36.5	9	27	46	309	23.5	**0**	**425**
Univ Washington	**24**	**1**	**8**	**31.8**	**1**	**64**	**27**	**199**	**27.1**	**336**	**1486**
Average w/o UW	26	7	8	38.1	5	42	45	246	22.7	52	229
Change to Reach Average	6%	633%	(4%)	20%	380%	(34%)	65%	23%	(16%)	(84%)	(85%)

	Staff Funded Centrally (FTE)	Faculty Budget ($M)	Staff Budget ($M)	TA Budget ($M)	Supp, Svcs Equip Budget ($M)	Total Budget	Federal Reearch Expenditures	Extramural Rsch Expenditures	SCH (Quarter Basis)
Michigan State	27.0	4.8	1.3	2.9	0.6	9.8	5.8	9.2	59,172
Ohio State	57.7	NA	NA	NA	NA	NA	7.0	11.0	79,986
Penn State	39.5	4.8	1.7	2.3	0.4	9.2	9.8	16.6	51,593
Purdue Univ	72.5	4.6	3.1	3.2	1.0	11.9	12.5	19.4	59,337
Univ Fla	34.5	4.8	1.9	2.4	0.3	9.3	6.1	10.6	62,711
Univ Wisconsin	55.8	3.7	3.0	1.8	0.6	9.0	11.9	18.2	67,533
Univ Washington	**40.5**	**3.9**	**2.0**	**1.5**	**0.2**	**7.6**	**16.2**	**23.5**	**60,774**
Average w/o UW	47.8	4.5	2.2	2.5	0.6	9.8	8.8	14.2	63,389
Change to Reach Average	18%	16%	10%	71%	227%	30%	(46%)	(40%)	4%

Table I-A. Selected Data on Chemistry Departments at Research Intensive Public Institutions. Data from the Council for Chemical Research annual survey of Chemistry Chairs. The six peer departments summarized here constitute all of the top-quartile (NRC, 1993) departments with undergraduate programs similar in size to UW Chemistry by means of total annual student credit hours who submitted data for this CCR survey.

The data in Table I-A allow one quickly to identify differences between UW Chemistry and the average of this set of peers. A consistent picture emerges from the data: *the centrally provided core instructional budgets that support faculty, staff, TAs, and supplies/services are on average 30% larger at the peer schools, corresponding to a shortfall for UW Chemistry of over $2M/year.* Four of the five peers that provided these financial data have total annual centrally provided budgets in the relatively narrow range of $9.0M to $9.8M, with the fifth, Purdue, having an $11.9M annual budget. (Ohio State Chemistry chose not to share financial data, so their budgets are not included in these averages. Historically, Ohio State Chemistry has had an extremely favorable budget.) UW Chemistry has a $7.6M annual centrally provided budget. At the UW, the shortfall of about $2M annually is spread among all four major budget categories (faculty salary, staff salary, TA salary, supplies/services), but the shortfall is greatest in the TA budget (short over $1M/year; requiring a 70% increase to reach the peers!), followed by the faculty salary budget (short $0.6M/year, a consequence of low UW faculty count, not low individual salaries), then supplies and services ($0.3M), and finally staff salaries ($0.2M). The gaps would be even larger if we corrected salaries for the high cost of living in Seattle relative to these peers.

It is noteworthy that relative to these same peers, the UW Chemistry faculty is far more successful at winning grant and contract funds for research. Our annual expenditures for research of about $23.5M exceed by 65% the peer average of $14.2M. Of course these funds are not available to support the instructional program.

Financial shortfalls are not in and of themselves damaging. Rather, it is the consequences of the shortfall that must be considered. Elsewhere in the table, one sees the consequences of the budget shortfall in terms of *personnel counts*. The average tenure track faculty size at the peers is 20% larger than ours (about seven more tenure-track members on average), and the peers have many more lecturers (on average five compared to our current one). The College has already promised funding for a second lecturer, for which a search is underway. The data set does not report the number of TAs supported from the TA budget at each peer during the academic year, but a good estimate can be derived by dividing the total salary budget by the academic year salary paid to each graduate student. These estimates have been confirmed in email or telephone exchanges with several of the peer departments. The peers typically have 120 to 175 TAs supported throughout the academic year; UW Chemistry currently deploys just 80 TAs on average throughout the academic year. The average staff size at the peer institutions is 8 FTE larger.

A smaller workforce, in turn, has consequences for the work accomplished. Whereas it is easy to learn the size of budget and employee number "gaps" between UW and these peer institutions, it is much more challenging to document in detail the attendant academic consequences for students and for the faculty, TAs, and staff who serve them, but we believe these to be large. We believe we know from information exchanges with many off-campus peers how we differ from our peers in this regard:

- *Our classes are on average larger.* For example, freshman chemistry at the UW is now offered in a lecture theatre to groups of 500 to 600; sophomore organic lecture is delivered to groups of up to 450. Physical chemistry for chemists is offered in groups of 80 and for biochemists in groups of 120 or more. At peer schools, all of these classes would typically be offered to groups of perhaps 2/3^{rds} this size.

- *We are not meeting student access demands.* Most of our classes at the lower division, and required laboratory courses at the upper division are full, with students waiting outside the door. Our majors typically take five years to earn an undergraduate degree; we presume that a portion of the time beyond four years is due to failure to be allowed enrollment in their preferred courses in a timely manner.

- *Each TA serves a larger number of students.* A decade ago, our Review committee urged the UW to provide enough new TA resources to allow the student:TA ratio then used in third quarter mainline freshman chemistry (24:1) to be extended to the first two quarters, which were then 48:1. A decade later, we have moved in the opposite direction from that recommended: first quarter freshman chemistry now has a student:TA ratio of 96:1 (!), and the second and third quarters are at 48:1. To achieve the 24:1 student:TA ratio recommended by the 1999 Chemistry Review Committee would require the addition of 52 new TAs throughout the academic year!

- *Because of high student:TA ratios, our lower division labs meet for fewer hours during a quarter*. First-quarter freshman now perform just four labs during a ten-week quarter. Students in their first quarter of organic laboratory a decade ago met for six hours per week in lab with their TA. Today these students have just four hours of laboratory per week, because each TA has twice as many students.

- *We rely more heavily upon temporary instructors.* Presently about twenty courses per year are taught by temporary instructors. Despite considerable effort to select and mentor temporary instructors, their efforts and how students receive them are not uniformly outstanding. A tenure-track faculty member or lecturer is more likely to have both the content knowledge and pedagogical experience to offer a high quality class.

- *Our course offerings are limited to the core courses required for our degrees.* As our student numbers at all levels have grown and as (since 2004) our faculty count has plummeted, we have stopped offering general studies courses and "small" courses (meaning ca. 15 to 30 enrollees) at the upper-division. The lengthy list that follows details courses we simply stopped offering over the past decade as a result of faculty downsizing and larger numbers of undergraduate students in the remaining classes: CHEM 105 (Chemistry in Context), CHEM 115 (Chemistry for Life), CHEM 397 (Scientific Presentation Skills), CHEM 415 (The Chemical Bond), CHEM 419 (Bioinorganic Chemistry), CHEM 428 (Bioinstrumental Analysis), CHEM 433 (Theoretical Organic Chemistry), CHEM 435 (Introduction to Biophysical Chemistry), CHEM 437 (Organic and Bioorganic Chemistry of Nucleic Acids and Proteins), CHEM 464 (Computers in Data Acquisition and Analysis), CHEM 471 (Physical Chemistry of Macromolecules), CHEM 475 (Honors Quantum Mechanics), CHEM 476 (Honors Thermodynamics), CHEM 477 (Honors Statistical Mechanics), CHEM 484 (Materials Chemistry), CHEM 502 (Practical NMR Methods for Biological and Organic Structure Elucidation), CHEM 540 (Special Topics Organic Chemistry), CHEM 560 (Special Topics Physical Chemistry).

On the positive side, our students are by and large satisfied with the content and instruction they receive in the courses we offer. Our faculty and TAs receive student teaching evaluations that are statistically indistinguishable from on-campus peers in other science departments, and even campus wide, which is remarkable given that students also rate our courses as on average more intellectually challenging and more time consuming than their other classes.

In the two chapters that follow, we provide a specific proposal for new investments that would in broad overview:

- Increase student access to our courses;
- Reduce class sizes;
- Increase the quality of the student experience in these courses;
- Increase the breadth of our course offerings;
- And consequently improve all aspects of the student experience.

Accomplishing these things requires that our budget be brought to peer levels. The specific proposed investment calls for:

- Expanding the current fewer than 33 FTE of tenure track faculty to a total of 40 FTE,
- Increasing the current one FTE of lecturers to a total of 5 FTE (one new FTE is already promised; three more are needed), and
- Dramatically increasing the investment in TAs, from the current 80 TAs during the academic year to a total of 120.

It is noteworthy that this last request, for 40 additional TAs during the academic year, is less than the 52 that, as noted above, would be required to implement the 24:1 student:TA ratio in freshman chemistry recommended by the 1999 Review Committee.

Specific significant positive impacts of the investment would be to:

- Eliminate the current heavy reliance upon temporary instructors;
- Cap the maximum class size in 100 level lecture courses at 400 (down from 500-600), at the 200-level to 300 (down from 400), and reduce the size of 400-level physical chemistry classes;
- Add sections of courses that are currently over-subscribed, reducing undergraduate student time to degree;
- Lower student:TA ratios, which will result in increased student time in laboratory exercises, and greater availability of TAs to provide feedback on student work;
- Add five new upper division undergraduate courses and several new graduate courses (for example in the materials chemistry area) to our annual offerings;
- Our programs will become more attractive to our top applicants for both faculty and graduate student slots.

In short, the proposed program of investments is critical to achieving our vision (see page iv). The cost of this program is consistent with the levels of investment in undergraduate education that should be possible (and indeed required by activity based budgeting) in an era of steep tuition increases while leaving ample resources for investment in our sister programs throughout campus who are deeply involved in undergraduate education and similarly underfunded at this time.

We believe it is critical to the future success of our instructional and research missions that the review committee endorse this proposal (or their preferred variant of it) in the strongest possible terms.

D. Changes in the Past Decade

In contemplating the future of Chemistry at the UW, it is informative to reflect on developments during the past decade that seem most likely to have impact on our future course. We believe that the following changes, most but not all of which augur well, rise to this level:

Changes in the Faculty. Between February of 1999, when the previous self-study was prepared, and Autumn 2011, the faculty count fell by about 5 FTE (from 37.5 to 32.8). Underlying this significant decrease in total was a much greater turn-over in the identity of our faculty members. Of the 39 individuals who comprised the 37.5 FTE serving in 1999, only about one-half remain on our faculty today. The other half of the 34 individuals who comprise the 32.8 FTE present today arrived during the past ten years. The names of those who departed and arrived since 2000 are provided in Chapter IV.

This turn-over has profound cultural consequences. The high fraction of relatively new faculty members has resulting in a healthy questioning of past practices and a desire to explore new approaches. The Department has successfully transitioned a potentially perilous passage in which long-standing intellectual leaders in the Department (Borden, Floss, Kowalski, B. Reid, Schurr and others) have been replaced by a new and highly capable generation.

A more mundane, but important, further change for the faculty involves changes in compensation. A decade ago, Chemistry faculty members were poorly compensated relative to chemistry faculty at public peer institutions, a situation typical in Arts and Sciences units. Then, full Professors of Chemistry required about a 30% raise on average to reach off campus peer salary levels. Today, UW Chemistry faculty members on average have salaries that are very close to the average at a set of typical public peers (not accounting for cost of living differences). Like most public institutions, we have in the past several years begun to see inequities in our salary structure appear due to wage stagnation. However, the huge average salary "gap" problem, for UW Chemistry at least, is for now surmounted. This is a welcome change that we hope will spread to other Arts and Sciences units. We hope also that UW will work to ensure that such gaps do not reopen in the future.

One contributor to closing the faculty salary gap was a commitment of what is now a significant fraction of the Department's endowment proceeds. About 3% of the 9-month baseline salaries for the Chemistry tenure-track faculty salary budget is currently paid from Chemistry endowment funds (about $100,000 per year). We are grateful that the College of Arts and Sciences approved our request to be allowed to make this investment, a step taken to improve faculty satisfaction and thus reduce the rate of departures. That said, for this reason about 1/4th of the Department's annual endowment proceeds are now committed in this way, which is most unusual for a public chemistry department. *Particularly given that Chemistry has seen disproportionate losses in centrally funded faculty FTE (in part due to the Department's bad fortune that faculty members left and released salary funds were used to cover budget cuts), we believe that the College of Arts and Sciences should relieve Chemistry of the obligation to cover these tenure-line faculty salaries with endowment proceeds.*

Changes in Scale of Instructional and Research Missions. As is repeatedly emphasized throughout this self-study, our undergraduate, graduate, and research programs all expanded dramatically during the past ten years, continuing two to three decade trends. The number of undergraduate degrees produced annually has more than doubled in the last decade, and the graduate program grew by nearly 50%, before losing some of these gains due to faculty and TA count downsizing. Grant and contract expenditures more than doubled during this period, to $23.5M per year. Two major NSF centers (an STC and the first "chemical bonding" center) were awarded to PIs on our faculty (Dalton and Goldberg). These changes substantiate the importance and quality of our contributions.

Prior to these developments, the 1999 review committee recommended an increase in faculty size and TA numbers to both lower instructor workload and to improve the student experience. These have not happened, arguably because financial circumstances have precluded it. This may change in the coming period as tuition revenues rise and are allocated on an activity based budgeting basis.

The scale and quality of the activities of the Department of Chemistry today have changed immensely in the last two decades, but the infrastructure of centrally provided support has been stagnant or even in decline. We argue herein that it is time to hit the reset button on our resource base.

Changes in Physical Spaces. Although we anticipate the need for continued laboratory renovations, and in particular further additions to the portfolio of spaces suitable for state-of-the art research instrumentation, the past decade has seen very positive developments in both the quantity and quality of research and instructional spaces. At the time of the 1999 review, the Department was struggling to accommodate our growing programs in existing spaces, due to shortfalls in both square footage and quality of the existing spaces. In the interim, some 30,000 asf of new laboratory and office spaces (on

the 3rd and 4th floors of Bagley Hall and in the Chemistry Library Building) were added to the Chemistry space portfolio. Additionally, the quality of the existing portfolio of spaces has been lifted by renovations. Examples include complete gutting and rebuilding of two of the four freshman instructional laboratories (with funding for a third in hand), as well as a room that is shared by upper division analytical and inorganic undergraduate laboratory courses. A number of research spaces in both Bagley Hall and the Chemistry Library Building have seen substantial upgrades. In all, we estimate that the UW has invested in excess of $10,000,000 during the past ten years on renovations to spaces assigned to Chemistry, for which we are extremely grateful. We do anticipate an eventual need for more "dry laboratory" spaces (suitable for mass spectrometry, lasers, etc.), as described in more detail under "Challenges" in Chapter IV.

Changes in Endowment. In the past decade there were two dramatic developments concerning the Department's endowment. On the positive side, over 40 new endowments were initiated, from gifts (and occasional matching funds) totaling nearly $6M, including the first two endowed chairs (requiring gifts totaling $1M or more). These gifts took the Department through the $10M mark in total market value of endowment, and on to nearly $15M. The second, and negative change, was brought on by the collapse of the financial markets in 2008. This dramatically reduced the value of the corpus (back to under $10M, which has now recovered to about $12M), and the percentage of the pay-out on the corpus (from 5% down to about 3.5%). Overall, the annual endowment payout in 2011 is a bit higher than a decade ago. But it is important to keep in mind that the entire endowment payout annually supplements our total instructional and research budget by only a bit over 1%, and that this payout is productively dedicated to on-going activities. At its current size, the endowment is not a solution to the financial shortfalls described elsewhere in this document.

Changes in Faculty Start-up Costs. In the course of the past decade, start-up costs for a new assistant professor hire have roughly doubled, from around $400,000 to $800,000 or more per hire. During much of the past decade, the Department was asked to contribute 1/3rd of each start-up package, a fraction that is unusually high by peer standards. We were able to rely upon the College and Provost to collaborate to provide the remaining 2/3rds. Since the financial crisis, our College no longer has sufficient start-up funds to meet hiring needs in the sciences. Unsolved, this would cause a crisis for the Department. *We ask that the review committee highlight this challenge to the administration, and urge a resolution that assures the availability of sufficient start-up funding to compete favorably for the very best faculty candidates as we first rebuild and then continue to sustain our faculty.*

Changes in Central Budgeting. The most dramatic change of all during the past decade for units involved in undergraduate instruction could turn out to be the adoption at the UW of "activity based budgeting" (ABB), a replacement for the existing incremental budgeting system. In incremental budgeting, new funds in the core budget (from rising tuition funds and state allocations) were annually allotted to Deans based largely upon qualitative considerations. Large changes in the budget for a college (and in turn a department) were uncommon under this system. Under ABB, tuition funds follow students formulaically to Deans, who in turn decide how to distribute funds among their departments. This, in combination with the delegation by our state legislature to the Board of Regents of all tuition setting authority, which will probably result in an unprecedented multi-year escalation of UW tuitions to nationally comparable levels, potentially sets the stage for correspondingly unprecedented new investments in undergraduate education.

E. Renewing a Partnership for Excellence

A decade ago, our 10-Year Review Self-Study presented a plan we called a "Partnership for Excellence". Chemistry proposed the steps we would take to improve the excellence of our programs, as well as to take on more students at both the graduate and undergraduate levels, and to increase our grant and contract expenditures. We sought corrections in the centrally provided annual budget (including faculty salary, TA salary, staff salary, and operations) as well as expansion or renovation of spaces available for instruction and research.

We hope the review committee agrees that Chemistry delivered on our portion of the proposal: As this Self-Study documents, our programs are in many respects greatly improved. Our undergraduate program, large by national standards a decade ago, went on to become the largest undergraduate degree-granting chemistry program in the nation. Our graduate program grew significantly. The extramural funds that fuel our research program improved markedly, with grant and contract expenditures more than doubling, driven by the combined success of PIs on our faculty winning individual investigator grants and two major national center grants.

The financial conditions that have prevailed at the UW during these years limited the ability of the administration to respond. Chemistry faculty salaries on average rose to peer levels, but the faculty count dwindled. The TA budget today pays for some 20% fewer TAs than a decade ago (due to the 2008 budget cut), despite substantial growth in the undergraduate program. As noted above, there was expansion and renovation of research and instructional spaces.

Looking forward, it is probable there will be substantial new tuition-derived resources to invest in undergraduate education. We are updating and renewing our call for a Partnership for Excellence. Absent these unusual historical circumstances (described briefly in the section above), the proposal herein would be overly ambitious. Under activity based budgeting, with double-digit increases in undergraduate resident tuition rates likely, we hope the committee agrees that such an investment in Chemistry is appropriate.

Chapter II
Undergraduate Program

A. Educational Mission and Goals

The mission statement and educational goals of the undergraduate program are available at http://depts.washington.edu/chem/undergrad/departmentgoals.html and included as Appendix F. In short, the educational mission of chemistry is to provide students with an atomic and molecular level understanding of the natural world. To accomplish this mission, our program provides students with fundamental chemical knowledge, basic laboratory skills, and the ability to formulate and test scientific hypotheses. In addition, undergraduate research is incorporated into the instructional and degree programs so that students can gain first-hand experience with research, and develop an overall awareness of the broader implications of chemistry in the world around them.

B. Organizational Structure

The organization of the instructional program can be partitioned into three areas: academic, advising, and instructional support.

- Academic. The Associate Chair for Undergraduate Education (Reid) oversees and advises the Chair on all aspects of the undergraduate degree programs (including admission, student progress toward degree, etc.) and courses (including instructional materials, access and scheduling issues, hiring and training of temporary instructors, etc.). The Associate Chair, assisted by selected faculty, also oversees the 100-level laboratories, maintains the lab manuals and syllabi for 100-level courses, and oversees TA training. The Associate Chair is chair of the Undergraduate Education Committee.
- Advising. The lead undergraduate adviser (Stone) and two other advisers (one at 0.75 FTE) oversee the advising program for our majors. Their efforts include managing admission logistics, assisting majors with course scheduling and registration, performing degree audits, handling degree petitions (which are forwarded to the Associate Chair for consideration), and organizing the departmental graduation ceremony.
- Instructional Support. Given the size of the undergraduate program, the instructional staff play a critical role in logistical support of our courses. The Director of Undergraduate Services (Harvey) oversees a staff that provides support for our laboratories and instruction (demonstrations, textbook ordering, lab set-up/take-down, grade management, and other course resources). There are currently six staff members providing laboratory support, and two staff members supporting instruction.

C. Course Offerings and Enrollment

We present in this section a summary of our undergraduate course offerings, and the enrollment levels in them. Course numbers, titles, and descriptions can be found at http://www.washington.edu/students/crscat/chem.html and are included as Appendix G. The undergraduate instructional mission of the Department of Chemistry has expanded relentlessly for the past some twenty-five years. Figure II-A below, presents the total annual undergraduate student credit hours (SCH) by course level during this time and the growth at each level across the last one and two decades. Growth has been largest, on both an absolute and percentage basis, in the 200-level, organic

instructional program, which has more than doubled in size during the past twenty years, with most of the growth happening since 2000. As one would expect given the large increase in undergraduate degree production (more than a doubling, see below), growth in the 300- and 400-level programs has also been robust, with a 60 percent increase across these two decades. The freshman level program has grown by about 30 percent, most of the growth occurring during the most recent decade. The resource base of faculty and teaching assistants has varied during this period, but *today we have fewer faculty and just a few more teaching assistants than we had in 1990.* The enrollment increases, as described in more detail below, were accommodated by a combination of increasing class sizes, increasing student:TA ratios, increasing use of temporary instructors, and cancellation of non-core course offerings for both undergraduates and graduate students.

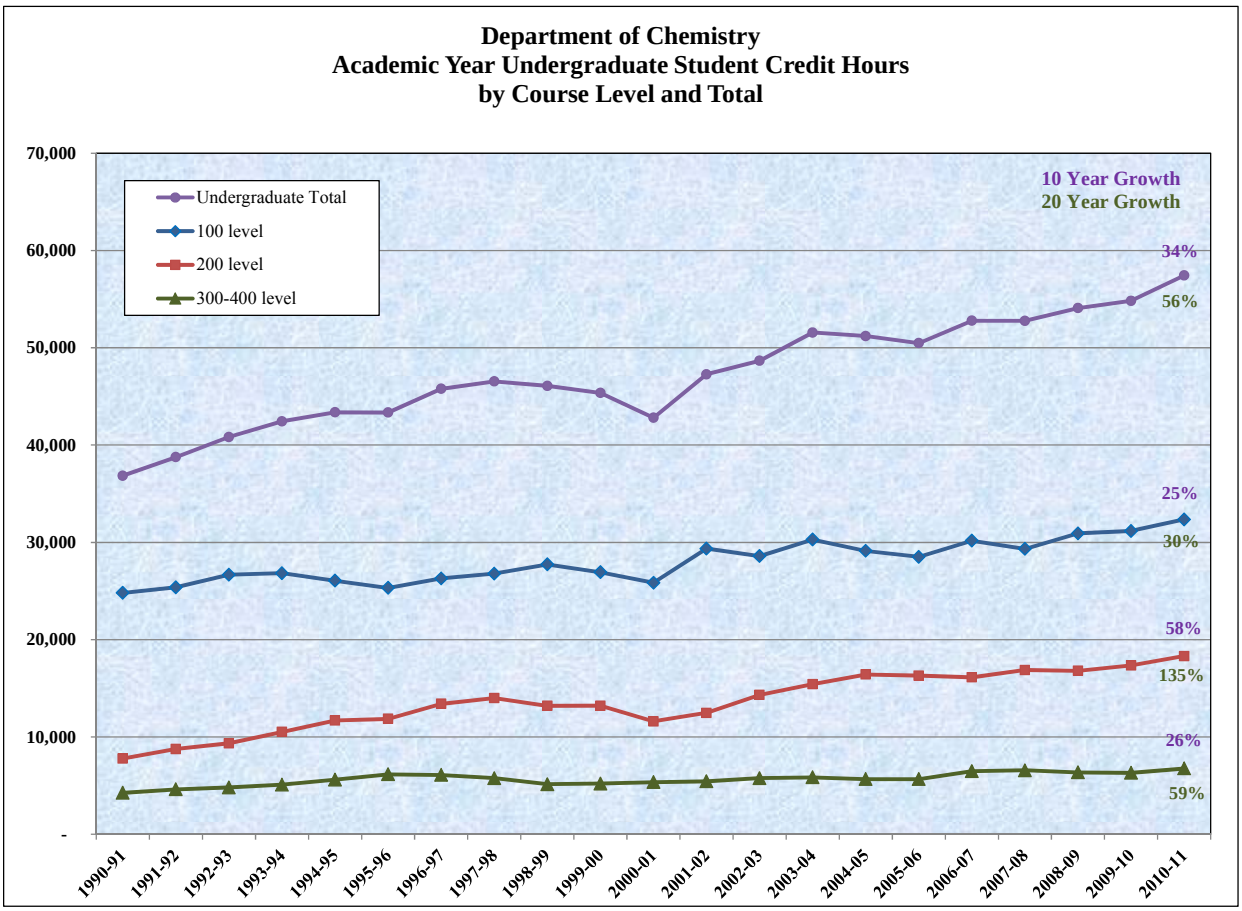


Figure II-A. Chemistry Undergraduate Student Credit Hours (SCHs), 1990-2011.

1. **<u>100-level courses</u>**. Courses at the 100-level largely involve introductory chemistry. There are three 100-level tracks:

   a. *Introductory Chemistry.* The CHEM 142/152/162 sequence serves as a foundation for a variety of degree programs. Roughly 30,000 SCHs of instruction were delivered in the last academic year, or half of the total SCHs delivered by the department. Currently, the courses are run in a large-lecture format (approaching 600 students per lecture section) led by a faculty member or Ph.D.-level temporary instructor augmented by TA-lead discussion sections, on-line learning (e.g., homework/tutorials, threaded discussion board, quizzes), and laboratory. The

subscribers to this course include students identified as pre-health (including pre-med students), pre-engineering, natural science, and other smaller programs (e.g., pulp and paper).

b. *Honors Introductory Chemistry.* The CHEM 145/155/165 sequence provides an advanced treatment of introductory chemistry for very highly-capable students. To enroll in this sequence, students must have an AP score of 4 or 5, or pass an entrance exam. Enrollment is limited to 72 students, and our majors originating from this sequence have been extremely competitive for UW (President's Medal) and national (Goldwater, Churchill, Marshall, etc.) awards (see below). Students frequently tell us that this sequence is the most challenging entry level honors coursework they encounter at the UW.

c. *General, Organic, and Biochemistry.* The CHEM 120/220/221 sequence is largely designed for pre-nursing students. With an enrollment of ~300 students, roughly 4000 SCHs per academic year are delivered through this sequence.

d. *Advanced Introductory Chemistry.* The CHEM 144/154/164 sequence was created in the 2009-10 academic year to serve chemistry and biochemistry majors and pre-engineering students interested in chemistry. This was a popular sequence with these students as evidenced by an enrollment ~150, but the sequence was suspended for the 2011-12 academic year due to the need to deploy the faculty FTE in our high-demand introductory track (142/152/162).

e. We additionally offer a single-quarter pre-introductory chemistry course, CHEM 110, the goal of which is to prepare students with very weak or no high school chemistry experience for entry into one of the above sequences. This course enrolls about 120 students per year.

2. <u>200-level courses</u>. Courses at the 200-level involve introductory organic chemistry. There are three tracks offered at the 200 level:

a. *Introductory Organic Chemistry.* The CHEM 237/238/239 sequence is the main organic sequence, with ~10,000 SCHs of instruction delivered in this sequence in the last academic year. To accommodate demand, course enrollments have increased to a maximum of 450 students/section, with large lectures instruction augmented by a TA-led discussion section for CHEM 237 and 238. Laboratory instruction is offered in the separate CHEM 241/242 sequence.

b. *Short Course in Organic Chemistry.* The CHEM 223/224 sequence is an abbreviated introductory organic sequence that enrolls about 140 students per year. The sequence serves students who desire or whose degree requirements are satisfied by a less in-depth coverage of this course material.

c. *Honors Organic Chemistry.* This sequence consists of CHEM 335, 336, and 337 and is a continuation of the honors introductory sequence. Enrollment has been ~40 students over the past few years. The lecture series is supported by a separate laboratory series (CHEM 346/347).

3. 300- and 400-level courses. Most enrollments at this level support degree programs in chemistry and biochemistry, and include both lecture and laboratory courses in analytical, inorganic, organic, and physical chemistry. A handful of upper-division electives are offered, but the number of these courses has decreased recently due to reductions in faculty FTE. It should be noted that the two biochemistry course series (BIOC 440/441/442 and BIOC 405/406, required for BS and BA degrees, respectively, in biochemistry) are taught by Department of Biochemistry faculty in the School of Medicine, and are not included in the Chemistry SCH counts reported herein (Figure II-A).

D. Undergraduate Degree Programs

Figure II-B presents enrollment in the chemistry and biochemistry BA and BS degree programs, as well as the Chemistry Minor from 1990 to present. The figure illustrates the dramatic growth in the total number of majors over the last decade from ~700 to ~1500. The number of minors has remained roughly constant, largely due to the enrollment pressure from our majors in upper-division courses (in particular, CHEM 321) limiting access to students pursing the minor.

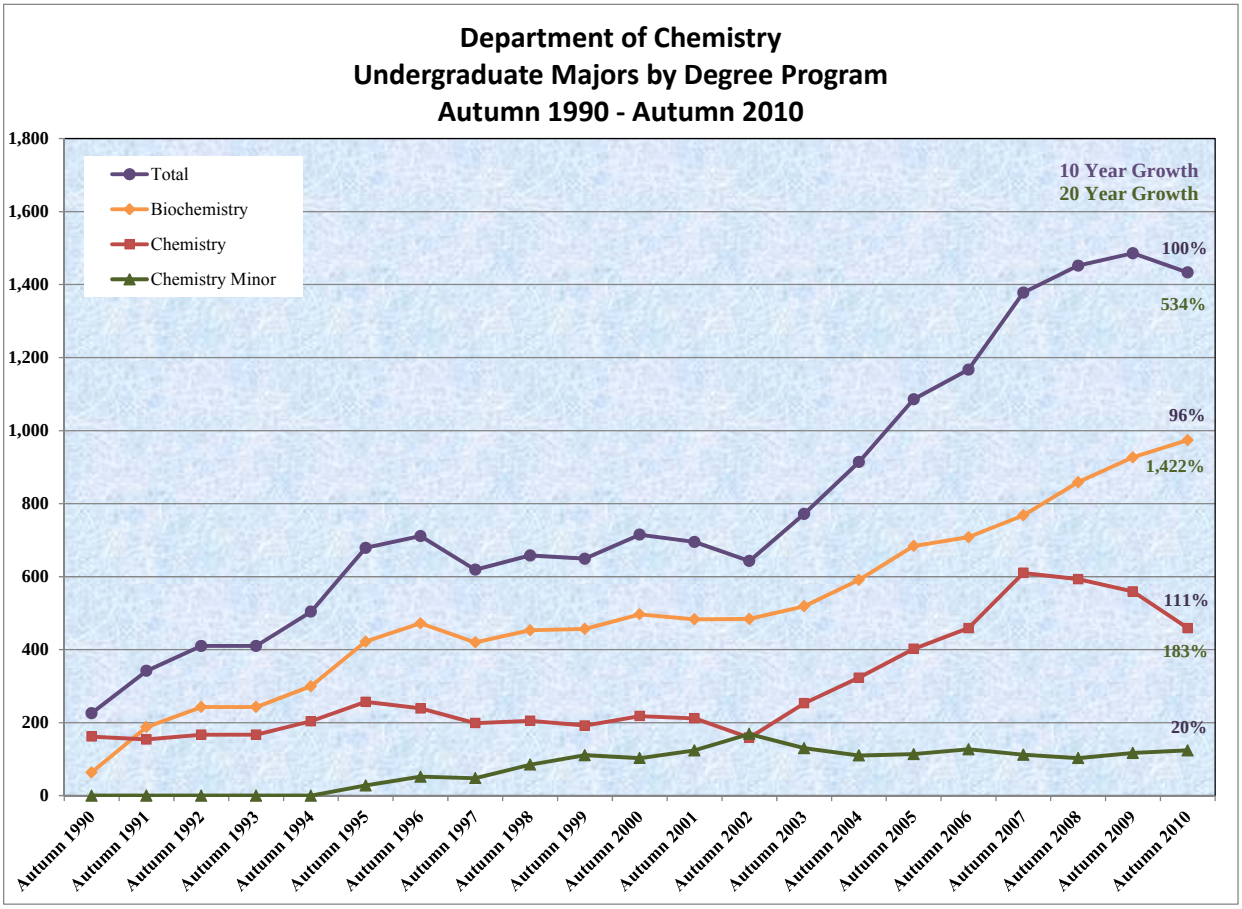


Figure II-B. Undergraduate Majors in Chemistry and Biochemistry Degree Programs, 1990-2010.

Figure II-C presents the number of BS and BA degrees in chemistry and biochemistry awarded from 1993 to present. The requirements for each degree are provided at http://depts.washington.edu/chem/undergrad/degreereqs.html and in Appendix H. Growth in the total

number of degrees awarded annually has paralleled the growth in majors, more than doubling over the past decade to the current level of ~350 bachelor's degrees/year. To put this in perspective, since the 2005-06 academic year our department has been the largest degree-granting program in the US followed by UCLA, UCSD, and U. of Texas (see Table II-A, taken from C&E News).

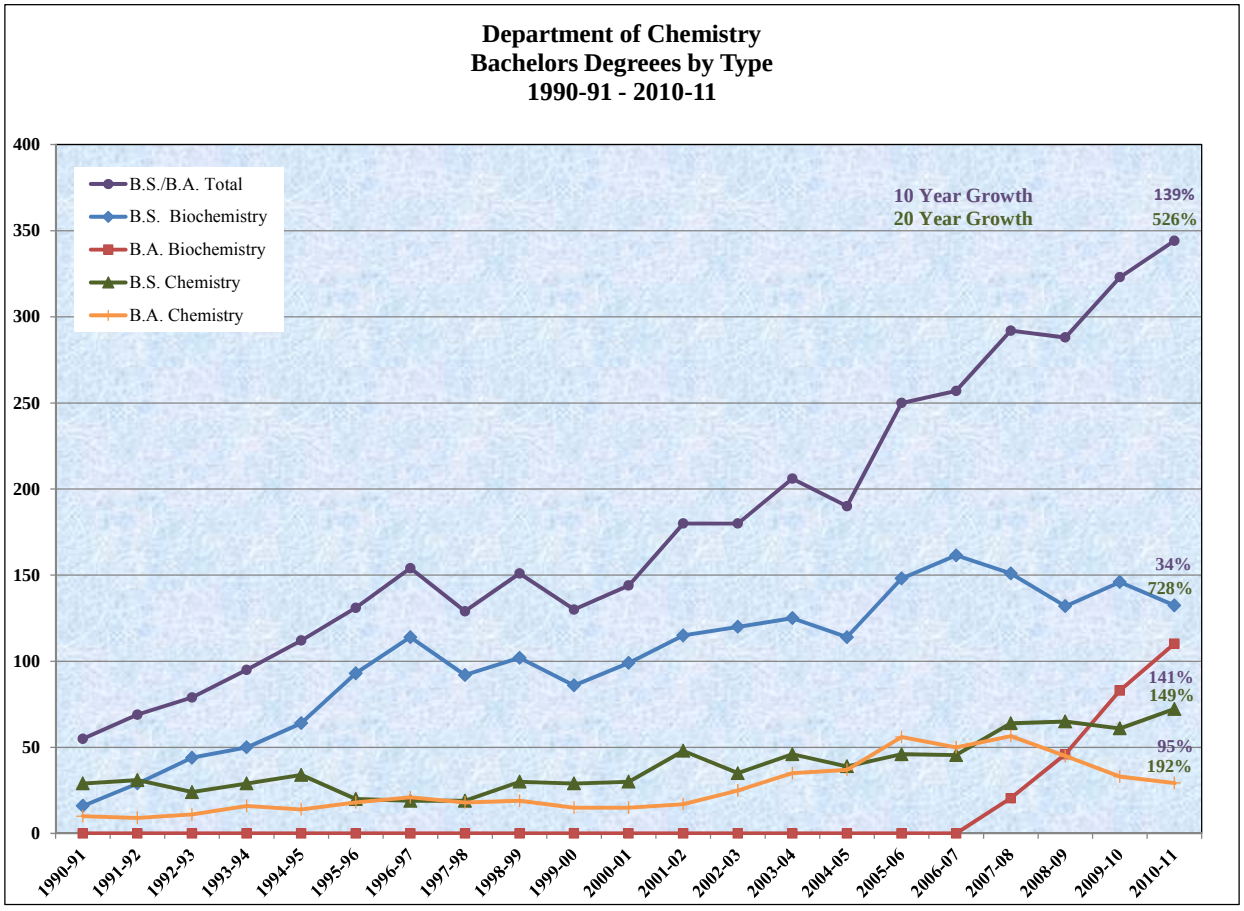


Figure II-C. Chemistry and Biochemistry BA and BS Degrees, 1990-2011. The "BS Chem" data are the sum of ACS-Certified and "Flexi-BS" degree recipients.

In response to student demand, the BA in biochemistry was created in 2008. Like the Biochemistry BS, the BA degree provides a solid classroom experience in biochemistry, but without the extensive advanced laboratory work required for the BS. The growth in the BA has been substantial over the past three years, and has had the effect of stabilizing the number of BS degrees offered over this same time period (Figure II-C).

Two BS degrees in chemistry are offered: an ACS-certified degree and the "flexible BS" with reduced upper-division laboratory requirements relative to the ACS degree. The flexi-BS is the more popular of the two BS degrees, accounting for roughly two-thirds of Chemistry BS degrees. The BA in chemistry differs primarily from the BS degrees in chemistry by a reduced requirement for upper division lecture and laboratory coursework in chemistry.

University Chemistry Departments Top 25 Producers of Bachelors Degrees 2008-09		
Rank	**Institution**	**Degrees**
1	University of Washington	**260**
2	University of California, Los Angeles	**227**
3	University of California, San Diego	**202**
4	University of Texas, Austin	**192**
5	University of California, Berkeley	**147**
6	University of Florida	**133**
7	University of North Carolina, Chapel Hill	**123**
8	University of Virginia	**119**
9	University of California, Irvine	**118**
10	University of Illinois, Urbana Champaign	**109**
11	Arizona State University	**101**
12	Emory University	**93**
13	Indiana University, Bloomington	**90**
14	California Polytechnic State University	**88**
14	University of Maryland, College Park	**88**
16	San Francisco State University	**85**
17	University of Colorado, Boulder	**84**
17	Temple University	**84**
19	New York University	**80**
20	University of Puerto Rico, Rio Piedras	**79**
21	University of Minnesota, Twin Cities	**77**
22	University of Michigan, Ann Arbor	**76**
23	University of Illinois, Chicago	**75**
24	Florida State University	**73**
25	State University of New York, Birmingham	**72**
Source: Report of the ACS Committee on Professional Training, 2009		

Table II-A. Largest Producers of Undergraduate Bachelor's Degrees in the U.S. UW is the largest degree-granting program in the U.S. in 2008-09, the most recent data available, followed by UCLA, UCSD, and U. of Texas.

E. Impacts and Responses to Growth

The substantial growth in the undergraduate program over the past decade unmatched by an increase in instructors necessitated a host of changes to our instructional and degree programs. An important administrative change has been the conversion of admission to our degree programs from "open" to "competitive". Previously, a student could declare a chemistry or biochemistry major at any time (including immediately before graduation). This complicated Department planning for enrollment, and allowed students with marginal academic qualifications (including some with little hope of meeting the GPA requirements for our degrees) to enter our degree programs. Since Spring 2009, admission to our degree programs has been by application only. In principle, this allows us to select the most highly qualified students to fill the available spaces in our courses. In practice, we do not believe that we have thus far turned away any academically qualified student from these degree programs, a practice we would strongly prefer to continue. Other changes to our undergraduate program include the following:

1. Lower Division Instruction

- Evolution to large-lecture instruction. In 2000-01 the largest section of any Chemistry course was 288 students, the maximum class size accommodated in the Bagley Hall large lecture theater (Bagley 131). Beginning in the 2001-02 academic year some lecture sections were moved to Kane 120 (capacity ~440) to accommodate enrollment demand. Today, essentially all sections of CHEM 142, 152, 162 are delivered in sections approaching 600 students. In addition, CHEM 237 and 238 sections are routinely delivered in 400-student sections or even larger. Even with the increased capacity provided by large-lecture instruction, enrollment pressure for our introductory chemistry series remains high, with roughly 900 students annually having to delay enrollment in the first quarter of the introductory series (CHEM 142) until Winter Quarter. We propose below to reduce these class sizes and to increase course offerings (for a net increase in access) in the future with new faculty resources.

- Use of technology to enhance learning in large lectures. Over the past decade we have incorporated a variety of technologies to enhance the learning experience in our 100-level courses. For example, on-line homework was initiated in 2004 using WebAssign. On-line resources including threaded discussion boards and on-line quizzes have been employed since 2005. Finally, personal response systems or "clickers" were introduced in our entry level courses in 2006.

- Modification of the 100- and 200-level laboratories. At the time of the last ten year review, the student:TA ratio in the mainline freshman chemistry sequence (CHEM 142/152/162) was 48:1 in the first two courses and 24:1 in the third (allowing the latter to include an appropriately intensive laboratory component). Over the past decade budget reductions and enrollment increases have resulted in a reduction in TA positions (from over 100 to 80 throughout the academic year). As a result, these ratios have changed to 96:1 in the first quarter, and 48:1 in the second and third quarters. Further, the number of laboratory experiments conducted by students was reduced in both CHEM 142 and CHEM 162. The TA grading load was also reduced by eliminating formal lab reports providing fewer opportunities for students to develop their writing skills. The first organic laboratory course, CHEM 241, which until recently enjoyed a 24:1 student:TA ratio, with sections of 24 students meeting in lab with their TA twice per week for three hour lab sessions, was restructured for financial reasons to accommodate a 48:1 ratio. Now, each student has one four-hour laboratory session per

week with her TA in a group of 24 students. The number and complexity of experiments each student conducts were reduced. The amount of student work hand-graded by the TA was also reduced. Students leave CHEM 241 far less prepared for subsequent lab work. Anecdotal reports are that student stress levels are higher with the reduced number of hours available in lab to complete their work: there is no margin for student error. All of these changes are deleterious to student learning. We propose to return to the 1999 levels of student:TA ratios, and to restore the curricula of these courses, if new TA resources are provided.

- Eliminating Study Center Staff**.** In 2001, the Department opened the Chemistry Study Center to provide tutoring and a structured learning environment for students in our 100-level courses. In 2007, the adjoining Organic Study Center was opened to support students in our 200-level courses. Both Centers have been heavily used by our thousands of lower-division students. However, reductions in TA lines have resulted in the Department no longer able to staff these Centers, which has seriously reduced their effectiveness. The UW offers tutoring through the Center for Learning and Undergraduate Education (CLUE). CLUE was a long-needed resource for our undergraduates, and does offer tutoring by undergraduate TAs for some of our courses. However, the synchronization of course content and expertise at CLUE can be challenging, and students have commented that this reduces the effectiveness of CLUE as a learning resource. We propose to restaff our study centers with new TA resources.

2. Upper-Division program

- Increased section size. A direct result of increased majors count was a corresponding increase in demand for upper-division courses. Examples of enrollment changes during the past decade for key degree program course requirements are presented in Figure II-D. The figure demonstrates the dramatic increase in enrollment at the upper division. In particular, CHEM 452 (thermodynamics) is required for our biochemistry degrees, and enrollment in this course has doubled over the past decade. The growth in enrollment has largely been accommodated by increasing section sizes. For example, in 2000-01 the sectional enrollment in CHEM 452 was ~75 compared to the current enrollment of ~150. Upper-division laboratories required for the Chemistry degrees have also seen pronounced increases in enrollment. For example, CHEM 321 (analytical chemistry) is continuously full, and the increases in enrollment evident in Figure II-D reflect times when we have offered additional sections and/or increased section size. This is also the case for CHEM 317 (advanced inorganic lab). Finally, increases in CHEM 455 (quantum mechanics) and 457 (statistical mechanics) directly reflect the increase in the number of chemistry majors. Most faculty members believe that the course quality has declined as enrollment has increased. We propose to reverse the latter with new faculty and TA resources.

- Reduced graded coursework. TA reductions over the past decade have also resulted in a decrease in the amount of grading support and a corresponding reduction in the amount of graded homework assigned. Currently instructors simply grade homework as “compliant”, and no detailed feedback is provided to the student. We propose to reverse this change with new TA resources.

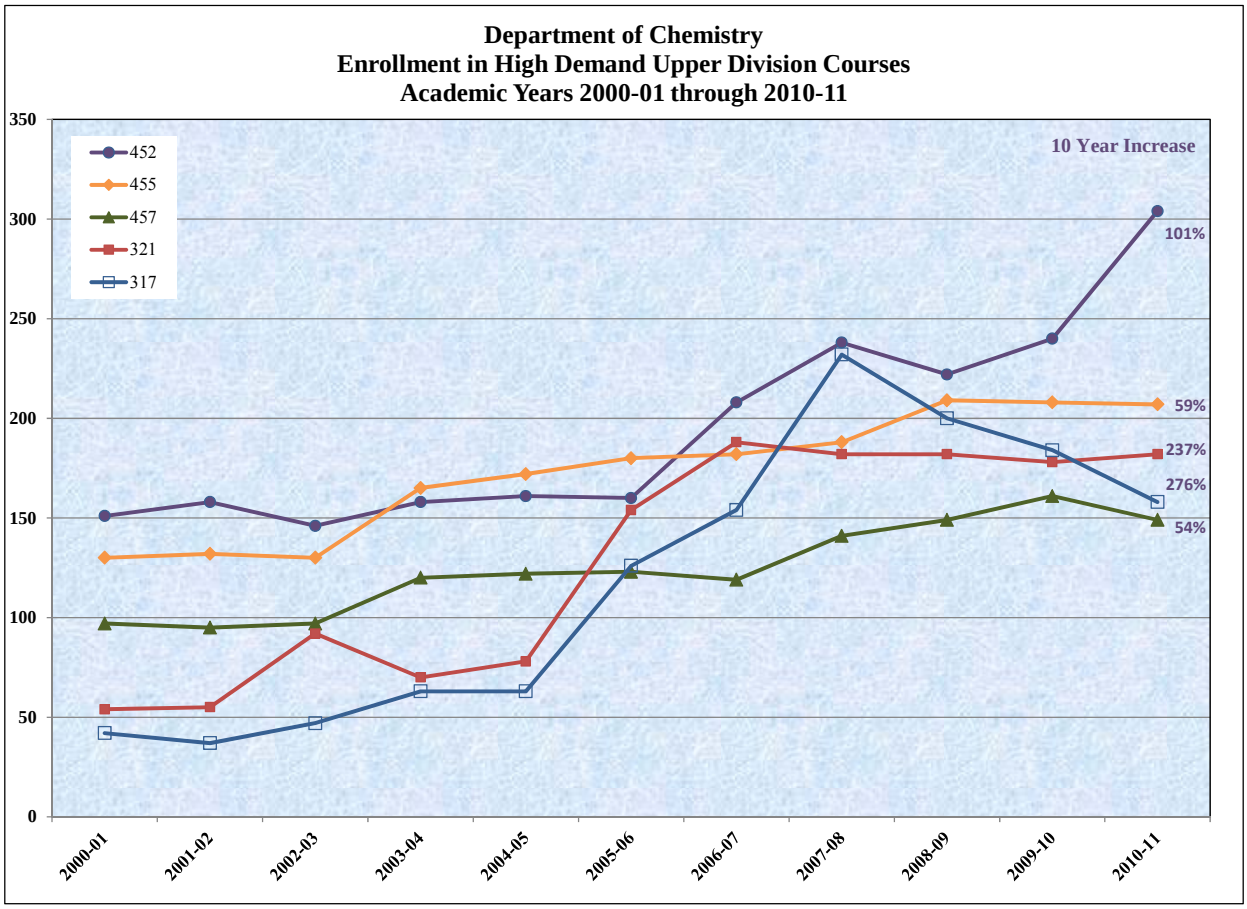


Figure II-D. Enrollments in High Demand Upper Division Courses Required for Undergraduate Degrees in Chemistry or Biochemistry.

- Reduction in number of electives. The decline in faculty FTE combined with the increase in majors count has required that core-course offerings be maintained (and expanded) at the expense of electives. Comparison of course offerings at the beginning of the past decade to the last academic year demonstrates that the following undergraduate electives are no longer offered:

  CHEM 105 Chemistry in Context
  CHEM 115 Chemistry for Life
  CHEM 397 Scientific Presentation Skills
  CHEM 415 The Chemical Bond
  CHEM 419 Bioinorganic Chemistry
  CHEM 428 Bioinstrumental Analysis
  CHEM 433 Theoretical Organic Chemistry
  CHEM 435 Introduction to Biophysical Chemistry
  CHEM 437 Organic and Bioorganic Chemistry of Nucleic Acids and Proteins
  CHEM 464 Computers in Data Acquisition and Analysis
  CHEM 471 Physical Chemistry of Macromolecules
  CHEM 475 Honors Physical Chemistry (Quantum Mechanics...now co-listed with 550)
  CHEM 476 Honors Physical Chemistry (Thermodynamics)

CHEM 477 Honors Physical Chemistry (Statistical Mechanics)
CHEM 484 Materials Chemistry
CHEM 497 Capstone Seminar Series

We have additionally discontinued a number of graduate course offerings that had historically benefitted our most talented undergraduates.

As much as we would like to add back all of these courses, this would be impossible even with the increased faculty count requested herein (from 33 to 40 FTE). Given other core instructional needs mentioned above (reduced class sizes, increased access, reduced or eliminated use of temporary instructors) there will be room to restore just a small subset of these courses. We do propose to restore about five of the above or new breadth offerings (such as materials chemistry) with new faculty resources.

F. Metrics of Instructional Quality

A variety of survey tools and metrics are used to gauge the quality of the instructional program, as described below.

1. Student Course Evaluations

Appendix I presents a summary of the departmental student evaluation ratings, and a comparison to other academic units in the natural sciences, and the UW as a whole. The “adjusted mean” is a metric that takes into account perceived course difficulty, class size, and other parameters affecting the student perception of the course. Therefore, the adjusted mean provides a way to directly compare classes across the UW. The data show that the adjusted mean of Chemistry for “Combined Items 1-4” is in the range of 4.0 to 4.2, essentially indistinguishable from the results for the natural sciences and UW faculty overall. Students thus perceive the instruction they receive in Chemistry to be comparable in quality to instruction elsewhere throughout the UW, or "very good" (4.0). These data also tell us, not surprisingly, that the course grade expected by students is somewhat lower in Chemistry compared to the Natural Science or the UW, and that students perceive the amount of effort to succeed to be somewhat higher in Chemistry versus the Natural Science and the UW.

2. Graduate exit survey

Graduating bachelor’s students are asked to complete an exit survey during their last quarter. The results from this survey (Appendix J) demonstrate that students are content with the Chemistry and Biochemistry degree programs. One issue that emerged from the survey was the lack of elective courses in Chemistry. In particular, some respondents have advocated for “Green Chemistry” and “Environmental Sciences” to be added to the undergraduate curricula.

3. American Chemical Society (ACS) certification

Every five years the ACS Certified BS degree in Chemistry is evaluated by the ACS. This process involves a tabulation of learning goals, instructional hours, sample curricula, and syllabi for all required courses for this degree. This information is evaluated by the ACS Committee on Professional Training to determine if the ACS should certify the degree. Since 2000 our program has been reviewed twice and we have been recertified each time.

4. Student awards

Our top undergraduates have been extremely competitive for UW and national awards. A list of selected award recipients is presented in Appendix K. Our majors have received eleven Goldwater

Fellowships as well as a Cambridge, Marshall, and Churchill Scholarship. With regard to UW awards, seven of our majors have been awarded the President's Medal.

5. **UW Recognition of Instructional Quality**

In the past decade two of our faculty members received the UW Distinguished Teaching Award (P. Reid, Keller), given to a single faculty member UW-wide at each rank (instructor, assistant, associate, full) each year. Our faculty members also participate in the Faculty Fellows Program, which provides instructional training to incoming faculty, and the Teaching Academy, which hosts workshops designed to improve instructional quality at the UW.

G. The Next Decade

During the past decade, our undergraduate program has been shaped largely by rising enrollments, erosion of our faculty count, and loss of TA resources. With the exception of UW Biology, this experience is without quantitative parallel in the sciences at the UW. In order to maintain access to our core classes, we have downgraded curricula in several courses. Rising tuition revenue paid by our students provides a significant opportunity, arguably even the responsibility, to strengthen our undergraduate program in ways previously unthinkable. Our vision for this decade is provided below.

1. Improve the student experience in our foundational courses

We are particularly interested in enhancing the learning environment and improving our ability to provide critical feedback to students concerning their progress in our courses. Specific activities we hope to pursue include:

- Rebuild the CHEM 142/152/162 program. The mainline sequence is presently dominated by temporary instructors, who lecture to groups nearly twice the size of a decade ago. The first and third quarter courses have experienced a doubled student:TA ratio, accompanied by reductions in laboratory work and graded lab reports. These changes have negatively impacted the student and faculty experience. With additional faculty lines, both lecturers and tenure line, we hope to eliminate the deployment of temporary instructors, and reduce class sizes to 400 or fewer per section. Additional TA lines will allow for restoration of the 48:1 student:TA loading in CHEM 142 and the 24:1 ratio in CHEM 162, allowing enhancement of the laboratory program in these courses, greater contact between students and TAs, and allow for an introduction of novel learning techniques (e.g., guided inquiry learning) in discussion sections.

- Reintroduce the CHEM 144/154/164 majors sequence. Students enrolled in this track were highly motivated to pursue degrees in the chemical sciences, and responded to the challenge provided by this sequence. In this sequence students were able to explore introductory chemistry in greater depth, and they were exposed to current developments in this field. In short, students interested in the chemical sciences are better served by a sequence geared towards their abilities and interests. New faculty resources are required.

- Expand CHEM 241 curriculum. Many institutions have two semesters of organic laboratory for sophomore students. Our program has just two quarters; it is important that each of these be substantive. We propose to return CHEM 241 to two three-hour laboratory meetings per week with a graded laboratory report for each experiment. New TA resources are required. It would be even better to take the next step of adding

a third quarter of organic laboratory coursework, so that undergraduates had a lab course to accompany each quarter of lecture in the CHEM 237/238/239 series, but this would require resources beyond what we request.

- Staff the Chemistry Study Center (CSS) and Organic Study Center (OSC). The CSS and OSC were highly valued by students in our 100- and 200-level courses. These centers provided students with a place to work with their colleagues in an environment where TA help was readily available. Without TA staffing, students needing extra help generally are left to hire a tutor (assuming they have the financial resources). Bringing TAs back to the CSS and OSC would restore this learning resource, and provide experienced help to all of our students.

- Introduce "studio-concept" instruction at the 100-level. Studio–concept instruction is a mix of lecture and hands-on (laboratory) learning. Originally developed for physics instruction, studio-concept learning has emerged as an effective approach in chemistry education as well. The lab renovations in Bagley Hall were done with an eye towards studio-concept instruction. Resources for curriculum development and TA training would allow us to incorporate this novel instructional approach in our 100-level course offerings, and take full advantage of the renovated laboratory space.

- Expand the use of technology in the classroom. Progress in this area is already underway. In our 100-level courses we are moving to ALEKS, which is a "smart" learning environment that adjusts to the abilities of each student. This is a significant advance beyond on-line homework in that the topics and learning objectives vary depending upon the content knowledge demonstrated by each student. In studies we have found that the extent of learning in this environment is predictive of course grade, thus providing students with direct feedback regarding their progress towards course learning goals (unlike WebAssign). We will also be expanding on-line learning to our 200-level courses.

- Hybrid courses and beyond. With the introduction of smart on-line learning platforms, the opportunity exists to explore hybrid course structures where on-line resources (lecture-casts, ALEKS, threaded discussion boards, etc.) are combined with personal instruction (laboratory, guided-inquiry discussion sections, etc.). We hope to comparatively measure student learning in a standard versus hybrid course. The hybrid course would also provide a first step towards a fully on-line version of the CHEM 142/152/162 series.

- Reintroduce and refine our "prep chem" offerings. Not all students interested in chemistry are prepared for entry into CHEM 142. These students require a prep-chem course before entry into the introductory chemistry sequence. We are currently modifying CHEM 110 to be a true prep-chem course in connection with the UW in the High School program. In addition, we would like to bring back CHEM 105 which provides non-science majors with an introduction to chemistry in the world around them. Currently, we do not offer a course designed for non-science majors.

2. Upper-division offerings beyond "bare bones"

A consequence of accommodating enrollment demand in our foundational courses while experiencing a reduction in faculty FTE was the suspension of many upper-division electives. In addition,

many of our required courses have seen substantial growths in demand (Figure II-D). To put this in perspective, the smallest lecture course a Biochemistry major will experience in our program will have an enrollment of 150, even as a senior! We propose to reverse this trend and enhance our upper-division program as follows:

- Create new electives and expand existing ones. A high priority will be to re-introduce several new upper-division electives. In particular, electives that expose students to emerging areas in chemistry (e.g., CHEM 428: Bioinstrumental Analysis, CHEM 484: Materials Chemistry) will be the first to be added. In addition, electives that provide enhanced research skills (e.g., CHEM 464: Computers in Data Acquisition) will also be high-priority additions. New faculty and TA resources are required.

- Improve the learning experience for majors. Given adequate resources, we will cap section sizes to ~80 students in CHEM 452, 453, 455, 456, 457 and provide increased TA resources so that graded work can be reintroduced into these upper-division courses. This will provide our majors with a richer learning environment and greater feedback regarding their progress towards meeting course learning goals. New faculty and TA resources are required.

- Add additional sections to CHEM 312, 317, and 461. Since these courses represent a "bottleneck" to progress towards degrees, additional sections of these courses would reduce the time to degree. In addition, most of the enrollment spaces in these courses currently go to graduating seniors. Additional enrollment space would allow sophomores and juniors to take these courses, which provide critical laboratory skills useful in research. Finally, increased enrollment in CHEM 321 would allow students pursing the minor to obtain their degrees in a timely fashion. New faculty and TA resources are required.

3. Developing metrics to measure learning outcomes

Given the large enrollments in our foundational courses, we propose to implement ways to measure student learning in these courses. Ideas we wish to pursue include:

- Introduce common finals at the 100- and 200-level. During quarters when we have multiple sections of the same course, many things can vary between sections including methods of instruction and course difficulty. These variations may have a direct impact on student learning. By introducing a common final in quarters when multiple sections are offered, we can measure the extent to which student learning goals have been met. It will also allow us to refine our pedagogy and curriculum in order to address areas in which students are having difficulty.

- Introduce a standard "exit" exam in the 100- and 200-levels. Here the idea is to measure overall student learning in the 142/152/162 sequence (and potentially 144/154/164), 223/224, and 237/238/239. A common cumulative exam would allow us to measure student learning throughout a course sequence, and refine our curricula to address weaknesses in students understanding. One simple implementation of this idea would be to make the CHEM 162 and CHEM 239 finals the ACS standard exams in introductory and organic chemistry, respectively.

- Use on-line learning environments as diagnostics of student learning. One of the main issues with our foundational course sequences is that students are provided minimal feedback on their learning. Usually this feedback comes in the form of a high-stakes test where recovery from a poor performance is difficult. On-line environments are available that provide students with individualized tutorials and learning assessments. Our initial studies of these environments have shown a correlation between performance in these environments and course grade. As such, these on-line environments hold the potential or providing students with a low-stakes assessment of their learning, and will allow instructors to identify at-risk students.

4. Renovating Instructional Laboratory Spaces.

During the past decade, mostly with funding provided by the central administration, we have made substantial progress at updating the portfolio of spaces in Bagley Hall in which we offer undergraduate instructional laboratories. Four of the six laboratory spaces used for freshman and upper division laboratories have now been renovated, or are in the process of renovation. These include Bagley 191, 290, 291, and 233. This leaves two rooms in need of renovation. We ask that the review committee renew the call for renovation of these spaces:

- Renovation of Bagley 236. This is the last of four rooms in which freshman laboratories meet that is in need of renovation. The sister rooms (233, 290, 291) have been or are being converted into innovative mixed use spaces (laboratory or quiz section) that will readily accommodate studio-concept instruction described above. The renovation of this last of the four freshman laboratories is our highest priority instructional laboratory renovation.

- Renovation of Bagley 293. Bagley 293 is used by our honors freshman students. These are the most talented students we serve. Their laboratory is in poor repair, described by a former Dean of Undergraduate Education as "something out of Dickens". Ideally, renovations will include low flow fume hoods sufficient in number to allow this room to serve as surge space for sophomore organic students, whose numbers are now on the cusp of overwhelming the Chemistry Building rooms (second floor) used for this purpose.

H. Conclusion

The America COMPETES Reauthorization Act of 2010, the National Science Board, and the National Science Foundation have all embraced increased STEM degree production as a national goal. The University of Washington is already a national leader in STEM degree production, producing a combined annual total of 350 bachelor's degrees per year in chemistry and biochemistry. In a future in which these students are paying peer level tuition, they deserve to receive a peer level quality education. The data (see Chapter I) tell us that the instructional budget of the Department is far short of that at comparable public schools, and the consequence of this is a large shortfall in teaching assistants and faculty members, as well as a shortfall in staff. We have outlined a program of improvements to our undergraduate instructional program that will be possible only with the requested significant increases in our TA and faculty numbers. The program we have described requires that our current budgeted level of 80 TAs during the academic year rise to 120, that our tenure line faculty count rise from 33 to 40, and our lecturer count rise from one to five. We seek the review committee's endorsement of this plan.

Chapter III
Graduate Program

A. Educational Mission and Goals

The goal of the Chemistry graduate program is to educate scientists capable of initiating and executing original research in all branches of chemistry. This is achieved by the close collaboration of each student with one or more UW faculty members across several years. Most of the students who are admitted to study toward the Ph.D. in Chemistry elect to be advised on their thesis research by one or more Chemistry faculty members. About 5% of Chemistry graduate students select a faculty thesis advisor outside the Department; a similar number of students admitted to other degree programs (e.g. Ph.D. in Physics, Materials Science and Engineering, Biochemistry, etc.) choose a Chemistry faculty member as their research advisor.

The health of our graduate program is intimately tied to our undergraduate and research programs. The graduate program facilitates undergraduate education, by serving as the primary source of teaching assistants for undergraduate courses. Our graduate students are the principal vehicle by which faculty members accomplish their research, which in turn forms the basis of each student's Ph.D. thesis. The graduate research effort is also important for connecting the Department of Chemistry with other campus units in interdisciplinary and multidisciplinary research activities within UW, nationally, and internationally. The strength of our graduate program and the quality and number of students that comprise it, are critical to the Department to recruit and maintain a stellar faculty.

The success of the graduate program is thus intimately linked to the success of the Department.

B. Organizational Structure

The Associate Chair for Graduate Education (Synovec) is appointed by and reports to the Department Chair. His duties include leading the Graduate Admissions Committee in the review of all applications for admission, and making admission and fellowship recommendations. The Associate Chair manages all graduate curricula related matters such as curriculum modifications, individual student course selection(s), and chairs the Good Standing Committee, which deals with issues of low scholarship and poor academic performance. The Associate Chair provides input and guidance to individual graduate students to optimize their experience in our program. The Associate Chair collaborates quarterly with the Associate Chair for Undergraduate Education to match graduate students to specific TA assignments.

The Graduate Program Coordinator (GPC) (Zigler) is a full-time administrative staff member, who works in conjunction with the Associate Chair managing the day-to-day academic and non-academic operations of the graduate program. For example, the GPC organizes recruiting trips during the admission season, assists graduate students with paperwork associated with the Graduate Program, and refers students to other resources such as consultation with the Associate Chair or other University personnel. We believe our students are aware that they can contact the Chair, Associate Chair, the GPC, or any other faculty or staff member, to seek assistance.

C. Enrollment, Degree Production, Time to Degree

Top-quartile chemistry graduate programs tend to have in the range of 5 to 8 or even more graduate students enrolled per tenure track faculty member. There is a strong correlation of this metric

with program ranking: more highly ranked departments tend to have graduate programs at the higher end of this range (e.g.,Wisconsin chemistry, a top-ten department, with over 300 students shared among about 37 faculty members, or 8.5 students per faculty member). The existence of this correlation is no surprise given the role of graduate students in accomplishing research, and the role research plays in graduate program rankings. The limiting resource in graduate program size tends to be financial: the marketplace in our field calls for students to receive a salary, tuition, and support for research costs. The size of a chemistry graduate program is thus determined by the dollars available to support research, teaching, and fellowship positions.

A decade ago, our tenure-track faculty of about 37 had resources to support about 170 graduate students, corresponding to fewer than five students per faculty member, at the low end of the range noted above (Figure III-A). We argued then that increased RA support (to be raised by the faculty) and TA support (to be provided centrally in response to our large undergraduate program) were critical to improving the research productivity, and thus in time the ranking of our program. Largely due to faculty effort in raising grant and contract funds, the average group size during the decade did grow to six or more students per faculty member, a ratio we have maintained.

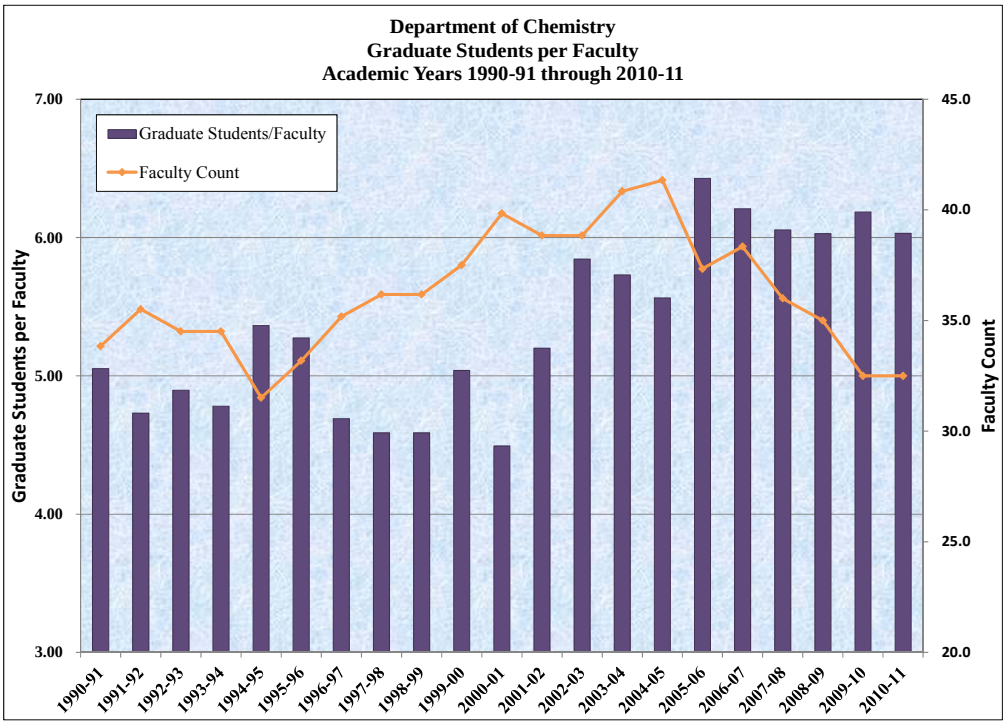


Figure III-A. Number of Graduate Students per Tenure Track Faculty, 1990- 2011.

Could we do better? In this Chapter, we show that grant and contract expenditures in our Department are already at the high end (among top ten in nation) of what can reasonably be expected from our faculty, some $23.5M in total annually, or on average about $750,000 per faculty member. In short, our faculty is providing RA support at an appropriate level. Unfortunately available total TA support is today less, by about 20%, than a decade ago--when the undergraduate program was much smaller! What is needed at this stage to improve our undergraduate and our graduate programs is adequate TA support for our undergraduate instructional program, which would add about one graduate student per faculty member to this metric, and would thus generate an increase in research productivity of about 20% per faculty member. In due course, one hopes that the larger, more visible

program will also attract more students who bring their own fellowship funds, bringing our program to the level of ca. 8 students per faculty member typical of the very best programs in the nation.
The growth of our graduate program during the past decade (Figure III-B) had the anticipated impact on degree production, which rose from the low 20s per year to the low 30s (Figure III-C). This rate of degree production places us nationally in the top 25 (Table III-A), and in some years in the top 10. Of course the decline in program size since 2007 will in due course produce a corresponding drop in rate of degree production.

The median time to the Ph.D. degree is a little over five years. The success rate for students who enter the program in achieving the Ph.D. is similar to that of our peers, about 68%. Many students who leave the program prior to earning the Ph.D. have self-selected to depart, though poor performance on the second year exam (see Section E, below) can be a precipitating event.

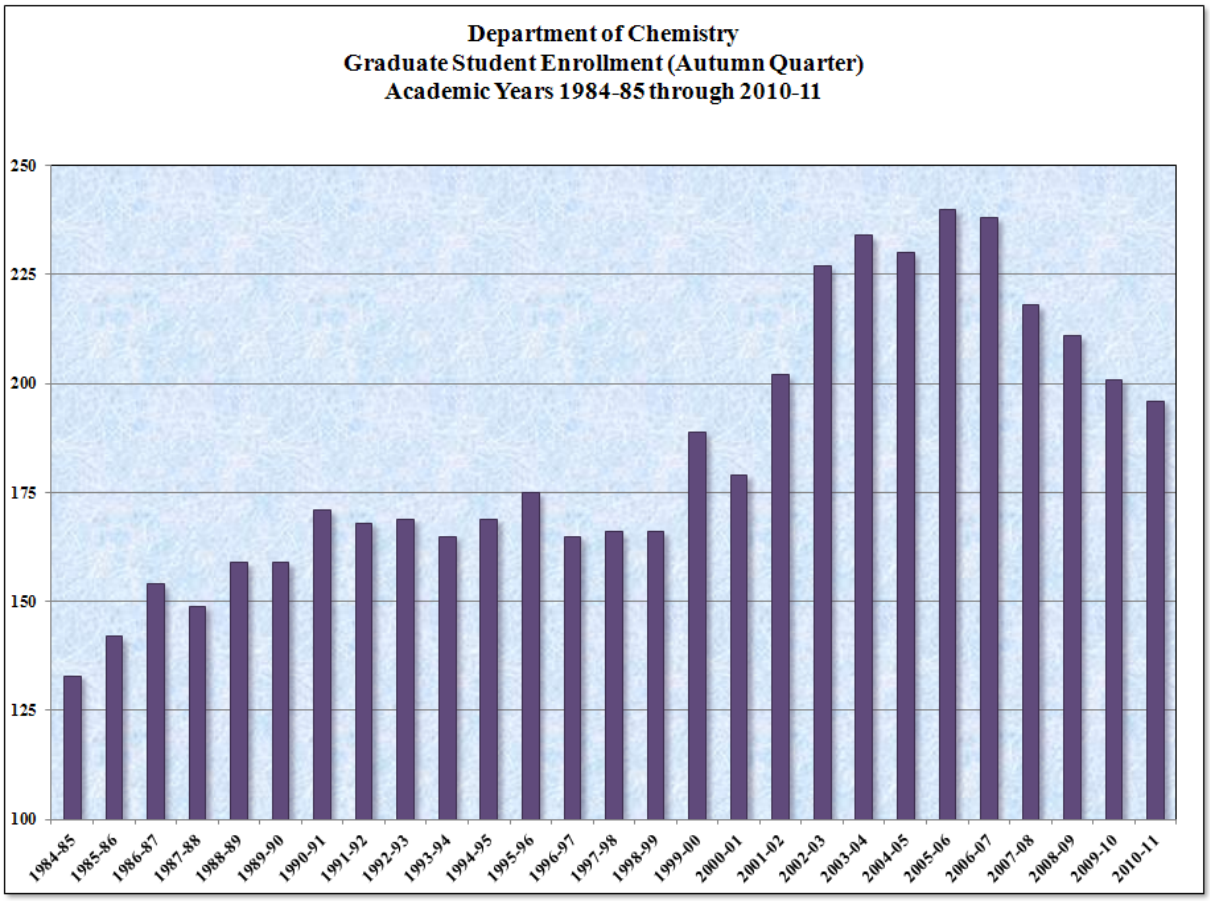


Figure III-B. **Autumn Quarter Graduate Enrollment, 1984-2011**.

D. Recruiting and Admissions Process

The graduate admissions committee annually reviews applications to our graduate program, focusing on each applicant's research background, statement of purpose, undergraduate and previous graduate program GPA(s), GRE scores, and relevant qualities evident from the letters of recommendation. Based upon a target class size (selected on the basis of anticipated available financial support), and with the expectation of an acceptance rate of about 33%, offers are extended. Financial

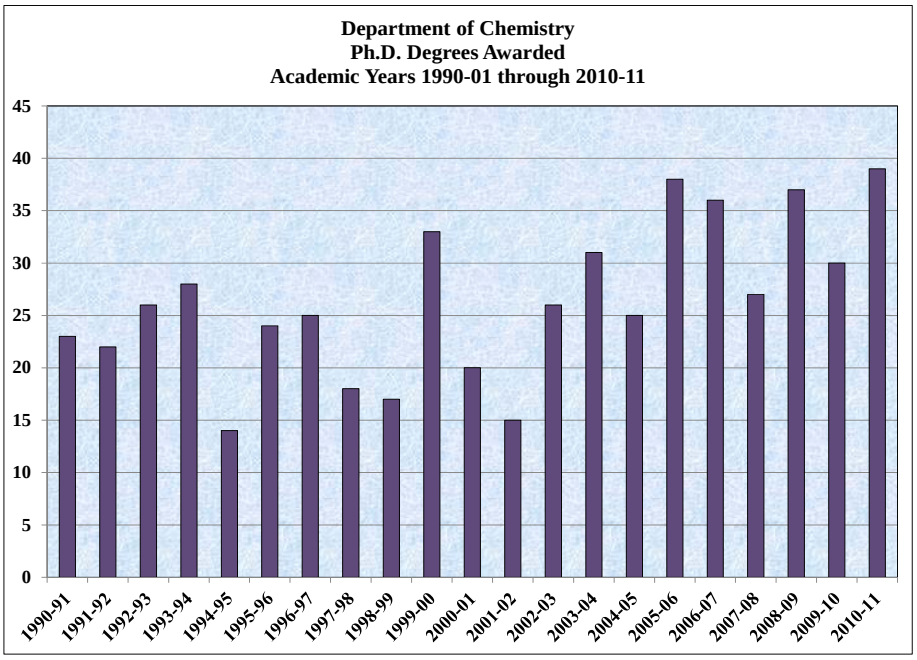


Figure III-C. Number of Ph.D. Degrees Awarded, 1990-2011.

University Chemistry Departments Top 25 Producers of Ph.D. Degrees 2008-09			
Rank	**Institution**	**Degrees**	
1	University of California, Berkeley	60	
2	University of California, Los Angeles	59	
3	Purdue University	54	
4	University of Illinois, Urbana Champaign	49	
5	University of Florida	48	
6	Massaschusetts Institute of Technology	43	
7	Georgia Institute of Technology	41	
8	University of California, Irvine	40	
8	University of California, San Diego	40	
8	University of Wisconsin, Madison	40	
11	Northwestern University	39	
11	University of Washington	39	
13	University of Pennsylvania	38	
14	University of North Carolina, Chapel Hill	37	
15	California Institute of Technology	36	
16	University of Michigan, Ann Arbor	35	
17	Cornell University	34	
18	Texas A&M University, College Station	33	
19	Michigan State University	32	
19	Wayne State University	32	
21	Stanford University	31	
22	Pennsylvania State University	30	
22	University of Texas, Austin	30	
24	University of California, Davis	29	
24	University of Utah	29	
Source: Report of the ACS Committee on Professional Training, 2009			

Table III-A. Top Twenty-five Producers of Ph.D. Degrees in Chemistry, 2008-09 (most recent data available).

support information is stated in the admission offer letter, which includes financial support in the form of a RA or TA (first-year students almost always are a TA, while beyond the first year support as a TA/RA depends upon whether funding as a RA is provided by their research advisor). Student funding is sometimes augmented by competitive fellowships from internal programs or national agencies. In order to be competitive with peer Chemistry programs, we have decoupled our TA and RA salary rates (which are equal to one another) from the UW standard salary levels, because the latter are far below the market salary levels for graduate programs in science, engineering and medicine. We set the rate to take into account the national marketplace, including the relatively higher cost of living in Seattle. We believe our current salary of $26,352 per year is nationally competitive.

In our field, to have any hope of an acceptance, every student must receive an offer to visit; the top half of students admitted also require a "signing bonus" fellowship offer based upon academic performance in the range of $1,000 to $7,500. This is one major use of our endowment funds.

This process has provided a graduate student population with the following characteristics. About 60% of our graduate students are from domestic undergraduate programs located west of the Mississippi River. The gender composition of our cohort has been very steady at 46% female to 54% male. On average, about 19% are international students (a very low fraction relative to off campus chemistry peers), and 13% are ethnic minority students (up to 18% in 2011). We recruit heavily, but not exclusively, from predominately undergraduate institutions (PUIs) in the Pacific Northwest and California. A component of our ongoing, recruiting effort includes faculty visits to PUIs and R1 programs. On such visits, faculty members recruit on behalf of their own research interests, but also in support of the Department as a whole.

E. Chronology

On entering the program, first-year students experience a two-week orientation including TA training, first aid training, academic advising for course selection, and general advice on how to succeed in graduate school. During this first year nearly all of our students focus on course work and TA duties, with the goal of finishing the required graded course work for the Ph.D. by the end of the academic year (18 graded course credits, typically six one-quarter, three-credit classes). Students are afforded considerable flexibility with regard to choice of courses (a recent departure from prescribed study "tracks"). In addition to graded coursework, students must register each quarter (except Summer) for a seminar series (one of: analytical, inorganic, nanotechnology, organic, or physical).

A shortcoming of our program, a consequence of our small faculty count, is the paucity of graduate courses we offer. We are able to offer on average just one graduate course at any given time in each of the traditional areas (analytical, inorganic, organic, physical). These tend to be "core" courses that cover the canon of our field. In the distant past, these core courses were supplemented with special topics courses that allowed the faculty and students to study emerging areas. Obviously such courses are a boon to both students and faculty members. We propose below that a small fraction of the new faculty resources we request be invested in new graduate courses, allowing us to introduce both a new material chemistry course sequence, as well as to offer new special topics courses in all of the traditional areas.

Selection of a faculty research advisor is a pivotal step for graduate students. During the Autumn quarter, first year students attend faculty talks to become acquainted with research opportunities. These talks are a springboard for first-year students to interact more intensely with various faculty and their research groups. This interaction culminates in January in the selection of a faculty thesis advisor for their Ph.D. studies, so both faculty members and students can make plans to initiate research. By the Summer quarter following the first academic year, students typically begin research in earnest, and most students do so in the capacity of a RA, supported by faculty-won grant funds.

In the second year of graduate school, graded course work not completed in the first academic year must be completed as soon as possible, in order to remain in good academic standing. Students are actively focused on research in order to facilitate success with a required second year exam. This exam assesses student progress to keep students on track toward the Ph.D. degree. Beginning in the Fall of 2011, all Chemistry graduate students will experience a common second year exam format, rather than one that varies across the traditional "divisions." The new format is comprised of written (report on research accomplished to date and an original proposal) and oral portions.

In the third year, we strive to have students take the General Exam, a Graduate School requirement, passage of which yields a Ph.D. candidate.

At various times, some of our students elect to become active in the Chemistry Club, an organization run by the students themselves, providing social activities and the Department's colloquium series, which our students oversee. The student club is a conduit for interactions between the graduate students and the department administration (staff and faculty leaders). Club leaders annually negotiate a (modest!) annual budget with the Department Chair. They coordinate with our staff to assure compliant and safe social gatherings in our spaces, etc.

Despite our intentions and exhortations, not all students follow the chronology described above. About one-third of our students take the General Exam beyond the third year, although almost all have completed it by the end of the Autumn Quarter in the beginning of their fourth year.

F. Indications of Quality

1. National Rankings

We discuss national rankings for our Department in the next chapter (Section C, Part 1). Typically, our program has ranked in the second decile (from the top) among about 180 Ph.D.-granting chemistry programs nationally. Selected sub-areas (analytical, inorganic, biochemistry) are ranked in the top decile.

2. Quality of Entering Graduate Students

Over the past three years, entering students had an average undergraduate GPA of 3.62, up significantly from an average GPA of 3.46 for the first three years of the ten year period (the overall average GPA over the ten years has been 3.54). The quantitative score on the GRE for entering students has averaged 711 out of 800. We preferentially admit students with excellent research backgrounds and attitudes as indicated in the letters of recommendation.

3. Student Outcomes

Our graduates generally find employment consistent with their educational background. We list below the graduation year and current position for twenty-two of the 298 students who earned the Ph.D. in Chemistry in the past decade (names removed to protect confidentiality):

2002 Associate Professor, Department of Chemistry, University of Utah
2003 Research Scientist, Pacific Northwest National Laboratory, Richland, WA
2003 Group Leader, Naval Research Laboratories, Washington, DC
2003 Professor and Chair, Department of Chemistry, State University of New York–Cortland
2003 Assistant Professor, Georgia Institute of Technology
2004 Assistant Professor, Department of Pathology, University of Chicago
2004 Senior Process Engineer, Intel Corporation
2004 BASF Chemical Company, New Jersey
2004 Assistant Professor, Department of Chemistry, Mercer University
2004 Staff Scientist, Genentech

2004 Patent agent in France
2004 Merck Research Labs, West Point, PA
2005 Assistant Professor, College of St. Benedict/St John University
2006 Assistant Professor, Department of Chemistry, Keene College
2006 Honeywell, Minneapolis MN
2006 Staff Scientist, Fred Hutchinson Cancer Research Center
2006 Clinical Chemist, Cedars-Sinai Medical Center
2006 Faculty member at Montana State University
2007 Assistant Professor, Department of Chemistry, Seattle Pacific University
2007 Senior scientist, University of Washington, Dept. of Genome Sciences
2008 Assistant Professor, Pacific Lutheran University
2010 Branch Chief, US Government Global Nuclear Forensics

G. Postdoctoral Research Associates

As close co-workers of our graduate students, postdoctoral research associates play a critical role in the graduate program and the research life of the Department. The Department of Chemistry has typically in the last decade had some 50 to 80 postdoctoral associates in residence at all times. Although the University keeps historical data for graduate students and faculty, which facilitates year to year comparison, the same kind of historical data for postdoctoral associates is not readily available.

The University of Washington has recently established an Office of Postdoctoral Affairs (http://depts.washington.edu/pdafrs/). This office supplements the mentoring that is provided by the faculty member with whom each postdoctoral associate is employed. Their programs include mentoring on such varied subjects as grant preparation, seeking academic jobs, and responsible conduct of research.

H. Challenges and Future Plans

1. Impact of Faculty Count Shortfall

In the next Chapter, we will describe the remarkable turn-over our faculty has experienced in the past decade. Twenty-eight tenure track faculty departures were only partially offset by eighteen new hires such that *we have lost about 20% of our faculty count.* We now have fewer than 33 FTE of tenure track faculty. Under these circumstances the vast majority of these faculty members teach core courses in our undergraduate curriculum. As noted above, at any given time we have just one graduate course running in each of the traditional areas (analytical, inorganic, organic, physical). Under the proposal to expand our tenure track faculty count to 40 FTE, and to add 4 new lecturers, the vast majority of the new available teaching will be invested in the undergraduate program. We are proposing, though, to add graduate special topics courses and a graduate materials course track with a small fraction of the available new resources.

2. Impact of TA Count Shortfall

We noted above that due to budget cuts, the number of TA positions available in our program during the academic year is today 20% smaller than it was a decade ago when the undergraduate program was much smaller (80 positions, compared to 100 a decade ago). As noted in Chapter II, this reduction has impacted the quality of our undergraduate program, particularly in the freshman and sophomore years. The loss of TA resources also forced us to downsize, and thus damaged our graduate and research programs. It is particularly unfortunate that this happened at a time when the fraction of our tenure track faculty that is at the assistant rank is very high (one-third), because junior faculty

members tend to be more dependent upon the availability of TA slots to support their nascent research programs.

In Chapter I we noted that our public chemistry peers on average have about 120 to 175 TAs during the academic year, or 50% to over 100% more than we now have. We believe it is reasonable to request allocation of TA salary funds to bring us to the lower end of this range. Of course, the primary impact of and the justification for this addition will be the many improvements that will become possible in the undergraduate program, including increased laboratory time for students, more graded work, and additional contact time with students. But the forty new slots will also positively impact our graduate program as well, by supporting about one new graduate student per tenure track faculty member in Chemistry. This will expand our program from 6 graduate students per tenure track member to 7. Because this count includes first year students, who tend not yet to be deeply engaged in research, this is effectively about a 20% increase in the research capacity for each group.

An additional positive impact on the graduate program would result from a small portion of these new TA resources being invested as TA support for graduate classes. Presently, due to the severe shortage of TA positions, we have almost zero TA support assigned to faculty members who are teaching graduate classes. As a result, graded assignments are limited or even non-existent in most of these courses. The addition of a fraction of a TA for grading and tutorial help would greatly improve student learning and the faculty experience in these classes.

I. Conclusion

The UW Chemistry graduate program has been on a multi-decade upswing in quality and scale. It has again flourished in the course of the past decade. Despite a declining faculty count, the program grew from the 150-170 student enrollment that characterized the program a decade ago to about 200 (and in the interim to about 240, prior to sharp declines in the faculty count). In the last five years, the Department of Chemistry has produced about 15% of all doctoral degrees awarded in the College of Arts and Sciences, and over 1/4th of all doctorates awarded in the sciences at the UW (34 of 124 annually, on average). This was achieved with about 5% of the total faculty of our College. The grants and contracts that fuel this program are at an all-time high, about $23.5M per year, more than double a decade ago.

Nevertheless, our graduate program has been held back by a historically weak local budget, and more recently by explosive undergraduate instructional program growth accompanied by budget reductions (raising TA workloads). In consequence we have a reduced tenure line faculty size and TA count. We offer fewer graduate courses than we believe is necessary; TA support in these courses is almost non-existent. When our graduate students serve as a TA, they often have more students assigned to them than are assigned to their off campus peers, potentially increasing their TA workload, and reducing the time they have for their own studies. Limited TA support can increase faculty instructional workload, reducing their attention to graduate education.

The proposal to increase our tenure line faculty count to 40, and to bring to 120 the number of TA positions during the academic year is justified primarily by the scale of our undergraduate program. Nevertheless, this investment is also critical to the future health of our graduate and research programs.

We hope the review committee will strongly endorse this request.

Chapter IV
The Faculty and Their Research

A. Administrative Structure

The Department is headed by a Chair appointed by the Dean of the College of Arts and Sciences for a term of five or fewer years. The Chair appoints Associate Chairs and departmental committees (Appendix E), sets the agenda for faculty meetings, and makes teaching and space assignments. In many of these tasks the Chair is assisted by faculty committees. The Chair represents the Department in interactions with the Deans', Provost's, and President's Offices. The Chair is the primary contact with our alumni and donors.

B. Facts and Figures

1. Current Faculty Members

The names and ranks of the current tenure-track faculty and lecturer are provided as Table IV-A, and those of the WOT (without tenure), research, adjunct and affiliate faculty as Table IV-B. The abbreviated curriculum vitae of the tenure-track and research faculty are contained in Appendix C.

2. Faculty Size

The size of the tenure line faculty (FTE) annually since 1984 (Figure IV-A) has varied from just under 32 to nearly 42 FTE. The growth phases coincide with investments to improve our research program (1980-1987) and to accommodate our growing undergraduate program and reward research success (1995-2004). The periods of decline reflect central budget shortfalls that precluded replacing separating faculty members. *The current faculty count is near the minimum for this period, despite the undergraduate and research programs being of record size.* The Divisional Dean for Natural Sciences has indicated that Chemistry and Biology (a unit with very similar problems) are the highest priority areas within the sciences for faculty growth, but that financial constraints preclude rapid reversal of this problem in Chemistry.

3. Faculty Turn-Over

Underlying the decline in faculty count by 8 FTE since 2004 are large changes in staffing across the decade. Changes since 2000 are summarized in Table IV-C, below. Since 2000, there have been 20 additions to our faculty: 16 junior hires, 2 senior hires, and 2 who have returned from extra-departmental administrative posts. The 18 hires over ten hiring cycles constitute a rate that is historically typical for us. But the "off rate" has considerably exceeded the "on rate"; the faculty count has declined. There have been 28 departures during this period: 16 retirements, one death, one failure to win tenure, and 10 who have resigned to accept employment elsewhere, as detailed in Table IV-C.

4. Faculty Age Distribution

The age distribution of our tenure line faculty (Figure IV-B) is more heavily weighted toward faculty members in their 30s and 50s, and lighter in the 40s and 60s age ranges. We anticipate just a few retirements during the next several years; such a lower separation rate would help us to rebuild our faculty count. But we can expect another wave of retirements similar in scale to what we have just experienced commencing about a decade from now.

Department of Chemistry
Tenure Line Faculty (Autumn 2011)

Faculty Name	Faculty Rank	FTE	Traditional Area	Research Areas
Andersen, Niels H.	Professor	1.0	Organic	Biophysical, Biorganic, and Medicinal Chemistry
Campbell, Charles T.	Professor	1.0	Physical	Nanoscience, Environmental Catalysis, Physical and Bioanalytical Chemistry
Chiu, Daniel T.	Professor	1.0	Analytical	Analytical, Biological, Materials, and Physical Chemistry, Nanotechnology
Drobny Gary P.	Professor	1.0	Physical	Physical and Biophysical Chemistry
Gamelin, Daniel R.	Professor	1.0	Inorganic	Physical Inorganic Chemistry
Gelb, Michael H.	Professor	1.0	Organic	Chemical Biology, Biochemistry, Bioanalytical Chemistry
Ginger, David S.	Professor	1.0	Physical	Physical and Materials Chemistry, Nanotechnology
Goldberg, Karen I.	Professor	1.0	Inorganic	Organometallic and Inorganic Chemistry
Heinekey, D. Michael	Professor	1.0	Inorganic	Organometallic and Inorganic Chemistry
Hopkins, Paul B.	Professor	1.0	Organic	Organic and Bioorganic Chemistry
Jen, Alex K.-Y.	Professor	0.0	Joint with MSE	Organic Photonics
Jenekhe, Samson A.	Professor	0.3	Joint with ChemE	Organic Photonics
Keller, Sarah L.	Professor	1.0	Physical	Biophysics and Physical Chemistry
Kovacs, Julia A.	Professor	1.0	Inorganic	Bioinorganic and Inorganic Chemistry
Mayer, James M.	Professor	1.0	Inorganic	Inorganic, Organometallic, Bioinorganic, Materials and Physical Organic Chemistry
Rathod, Pradipsinh	Professor	1.0	Organic	Malaria Pharmacology, Functional Genomics
Reid, Philip J.	Professor	1.0	Physical	Physical Chemistry
Reinhardt, William P.	Professor	1.0	Physical	Theoretical Chemical Physics
Robinson, Bruce H.	Professor	1.0	Physical	Biophysical and Physical Chemistry
Sasaki, Tomikazu	Professor	1.0	Organic	Bioorganic, Organic, and Biostructural Chemistry
Synovec, Robert E.	Professor	1.0	Analytical	Analytical Chemistry
Turecek, Frantisek	Professor	1.0	Analytical	Mass Spectrometry
Varani, Gabriele	Professor	0.5	Organic	Physical and Biophysical Chemistry
Michael, Forrest E.	Associate Professor	1.0	Organic	Organic and Organometallic Chemistry
Boydston, Andrew J. (A.J.)	Assistant Professor	1.0	Organic	Organic, Organometallic, and Polymer Chemistry
Bush, Matthew	Assistant Professor	1.0	Analytical	Bioanalytical and Biophysical Chemistry
Chatterjee, Champak	Assistant Professor	1.0	Organic	Synthetic Protein Chemistry, Chemical Biology, Biochemistry
Khalil, Munira	Assistant Professor	1.0	Physical	Physical Chemistry
Lalic, Gojko	Assistant Professor	1.0	Organic	Organic and Organometallic Chemistry
Li, Xiaosong	Assistant Professor	1.0	Physical	Theoretical Chemistry
Maibaum, Lutz	Assistant Professor	1.0	Physical	Theoretical Physical Chemistry
Maly, Dustin J.	Assistant Professor	1.0	Organic	Biological Chemistry, Catalysis
Masiello, David J.	Assistant Professor	1.0	Physical	Theoretical Chemistry, Many-body Theory, Nanoscale Optics
Stoll, Steffan	Assistant Professor	1.0	Physical	Physical Chemistry, EPR
Zhang, Bo	Assistant Professor	1.0	Analytical	Analytical, Bioanalytical, and Electrochemistry
Lecturers				
Carroll, Andrea	Lecturer	1.0	-	-

Table IV-A. Tenure Line Faculty and Lecturer of Chemistry, Autumn 2011.

Department of Chemistry
Additional Faculty (Autumn 2011)

Faculty Name	Faculty Rank	Affiliations
Research Faculty		
Burgess, Lloyd	Research Professor	
Kaminsky, Werner	Research Associate Professor	
WOT Faculty		
Spiro, Thomas G.	Professor	
Davidson, Ernest R.	Professor	
Adjunct Faculty		
Bruce, James	Professor	Genome Sciences
Goodlett, David	Professor	Medicinal Chemistry
Klevit, Rachel E.	Professor	Biochemistry
Krohn, Kenneth A.	Professor	Radiation Oncology
Murray, James	Professor	Oceanography
Olmstead, Marjorie A.	Professor	Physics
Parson, William W.	Professor	Biochemistry
Stenkamp, Ronald E.	Professor	Biological Structure/Biochemistry
Stuve, Eric M.	Professor	Chemical Engineering
Yager, Paul	Professor	Bioengineering
Affilifate Faculty		
Ahmed, Takiya	Affilifate Assistant Professor	Dow Chemical Company
Baer, Donald	Affiliate Professor	Pacific Northwest National Laboratory
Carlson, W. Brendan	Affilifate Assistant Professor	Seattle Polymer Company
Chambers, Scott	Affiliate Professor	Pacific Northwest National Laboratory
Dovichi, Norman	Affiliate Professor	University of Notre Dame
Grate, Jay	Affiliate Professor	Pacific Northwest National Laboratory
Haight, Gilbert, Jr.	Affiliate Professor	University of Illinois
Kahr, Bart	Affiliate Professor	New York University
Kay, Bruce	Affiliate Professor	Pacific Northwest National Laboratory
Peden, Charles	Affiliate Professor	Pacific Northwest National Laboratory
Phelan, Gregory	Affilifate Assistant Professor	National Oceanic and Atmospheric Administration
Quinn, Patricia	Affiliate Professor	Pacific Marine Environmental Laboratory
Raschke, Markus	Affiliate Professor	University of Colorado - Boulder
Simon, Julian	Affiliate Associate Professor	Fred Hutchinson Cancer Research Center
Sullivan, Philip	Affilifate Assistant Professor	Intellectual Ventures Management, LLC
Varanasi, Usha	Affiliate Professor	Northwest Fisheries Science Center

Table IV-B. Without Tenure, Research, Adjunct and Affiliate Faculty, Autumn 2011.

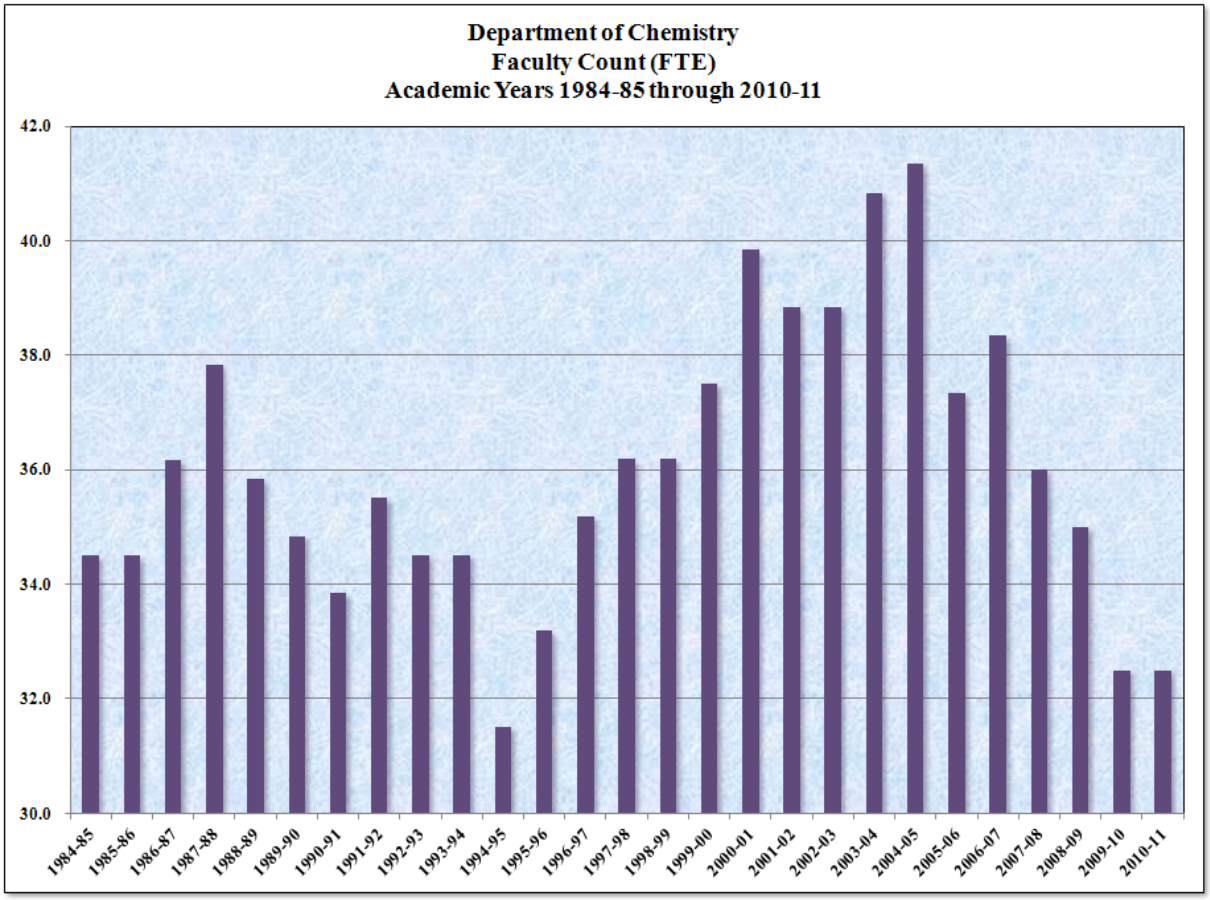


Figure IV-A. Tenure track faculty count (FTE) in Chemistry, 1980-2011.

5. Faculty Diversity

Our vision for 2020 states that we will be a community of faculty, staff, and students with diversity as a core value and that the face of our department will reflect the face of America. In some respects we have already done well at achieving this, but in others less so. On the positive side, men and women are nearly equally represented in our graduate (54% male/46% female) and undergraduate student majors (about 50/50). And until some recent retirements, we were a national leader by the measure of African Americans on our faculty. On the other hand, our progress at recruiting and retaining women and Hispanics on our faculty has been less than we had hoped. We presently have no Hispanic faculty members. Among our 33 FTE of tenure line faculty, we presently have 4 female members. While on the one hand, by this measure, our fraction of females on the tenure line faculty is thus almost exactly at the average (about 13%, according to 2007 Nelson Diversity Survey) of the top 50 departments of chemistry nationally, this low level is a disappointment. Had two females not elected to leave during the course of the last decade (Frank, Koeller) and instead received tenure, our situation would be improved.

The applicant pool for our faculty positions typically includes only about 10% women. In review of these applicants, women have competed favorably, being interviewed at about twice this proportion. The rate at which offers are extended to women mirrors the fraction interviewed: During the intervening past 16 search cycles, 49 individuals received offers, 11 of whom were female, or about 22%. Four females accepted, but as noted above, two of these left by choice.

	Departures			Arrivals		
Year	**Name**	**Area**	**Reason**	**Name**	**Area**	**Reason**
2001	Floss	Organic	Retired	Rathod	Organic	Senior Hire
	Slutsky	Physical	Deceased	Varani	Physical	Senior Hire
2002	Beeson	Organic	No Tenure	Christian	Analytical	Return from Admin
2003				Ginger	Physical	Junior Hire
				Koeller	Organic	Junior Hire
2004	Koeller	Organic	Resigned (to NIH)	Bartholomew	Organic	Junior Hire
	B. Reid	Physical	Retired	Michael	Organic	Junior Hire
	Woodman	Organic	Retired	Kwiram	Physical	Return from Admin
2005	Borden	Organic	Resigned (to U North Texas)	Li	Physical	Junior Hire
	Engel	Physical	Retired			
	Frank	Organic	Resigned (to U Victoria)			
	Jonsson	Physical	Resigned (to U Iceland)			
	Macklin	Inorganic	Retired			
2006	Christian	Physical	Retired	Maly	Organic	Junior Hire
				Raschke	Physical	Junior Hire
2007	Kwiram	Physical	Retired	M. Khalil	Physical	Junior Hire
	Schurr	Physical	Retired			
	Xia	Physical	Resigned (to WUSTL)			
2008	Bartholomew	Organic	Resigned (to industry)	Lalic	Organic	Junior Hire
	Callis	Analytical	Retired	Zhang	Analytical	Junior Hire
	Epiotis	Organic	Retired			
2009	Gammon	Analytical	Retired			
	Kahr	Organic	Resigned (to NYU)			
	Ruzicka	Analytical	Retired			
	Zoller	Analytical	Retired			
2010	Dovichi	Analytical	Resigned (to U Notre Dame)	Boydston	Organic	Junior Hire
	Prezhdo	Physical	Resigned (to U Rochester)	Chatterjee	Organic	Junior Hire
	Raschke	Physical	Resigned (to U Colorado)	Masiello	Physical	Junior Hire
2011	Dalton	Physical	Retired	Bush	Analytical	Junior Hire
	Norman	Inorganic	Retired	Maibaum	Physical	Junior Hire
	Raucher	Organic	Retired	Stoll	Physical	Junior Hire

Table IV-C. Tenure Track Faculty Turn-over 2001-2011.

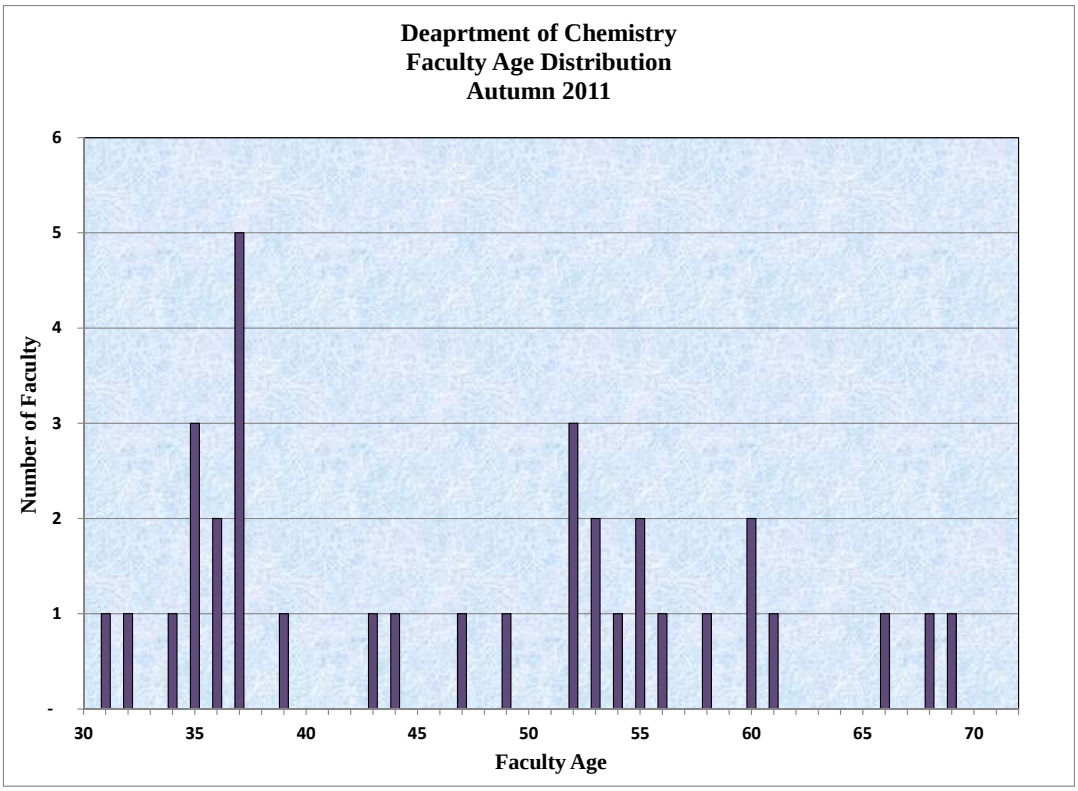


Figure IV-B. Age Distribution Chemistry Tenure Track Faculty, Autumn 2011.

It is our plan to continue to search openly with respect to research area (see below), and to give preference to hires that move us toward our vision, which includes greater diversity. Our ability to recruit members of under-represented groups, for whom competition is often fierce, would be improved by the availability of a resource pool to fund spousal hires.

C. Indicators of Quality

1. National Rankings

In 1993 the National Research Council ranked disciplines at universities by the "perception of quality" of their faculties, based upon a survey of faculty opinions. UW Chemistry ranked 28th of 168 Ph.D.-granting chemistry departments, the 83rd percentile. Public chemistry departments of similar rank included Purdue, Iowa State, University of Florida, and the University of Utah. We were then judged to be slightly superior to University of Michigan, University of California Irvine, and Colorado State, and slightly inferior to University of Minnesota and Ohio State.

U.S. News and World Report ranked chemistry graduate programs in 2010. Like the 1993 NRC rankings, these rankings are also determined by a faculty survey. UW Chemistry ranked 26th, but ranked appreciably better in the sub-areas of analytical (8th), inorganic (11th), and biochemistry (13th). [We acknowledge the updraft provided by the Department of Biochemistry in our medical school.]

In 2010, the NRC ranked graduate programs by two related and methodologically complex methods that attempted to introduce data about programs into the rankings. By one method ("regression"), UW Chemistry had a ranking range of 12-35 (5th percentile to 95th percentile) out of 178 programs. Using the center of this range (for UW, 23.5) as a summary metric for all programs places us 19th in rank order on the list of 178 schools. By the other ("statistical") our ranking range was 23-66. (These are the corrected rankings, released in Spring 2011.)

These ranking methods thus relatively consistently place our program in the second decile from the top among chemistry graduate programs nationally.

2. Grant and Contract Expenditures

To the extent that grant and contract funds are competitively awarded, as are the vast majority of our research expenditures, the level of these expenditures is an indication of quality. Grant and contract expenditures in UW Chemistry have risen extraordinarily in the past 40 years (Figure IV-C).

The National Science Foundation annually compiles data on the extramural research expenditures of departments of chemistry nationally. The growth rate of our expenditures has greatly outpaced our peers. We report in Table IV-D the federally financed expenditures, rather than total, because the latter is influenced strongly by institutional investment, which at UW is relatively low. At the time of our last 10 Year review, our rank by the measure of federal research expenditures was similar to or lower than our NRC reputational ranking, about 30th to 50th nationally. In the most recent data set (Table IV-D, released July, 2011), UW Chemistry ranks 6th nationally by this measure in FY2009. This outstanding ranking is representative of our standing for the last several fiscal years. [The values in the Figure IV-C and Table IV-D are not in agreement because of differences in accounting methods. For example, the NSF data do not include equipment expenditures, and use imputed rather than actual indirect cost expenditures.]

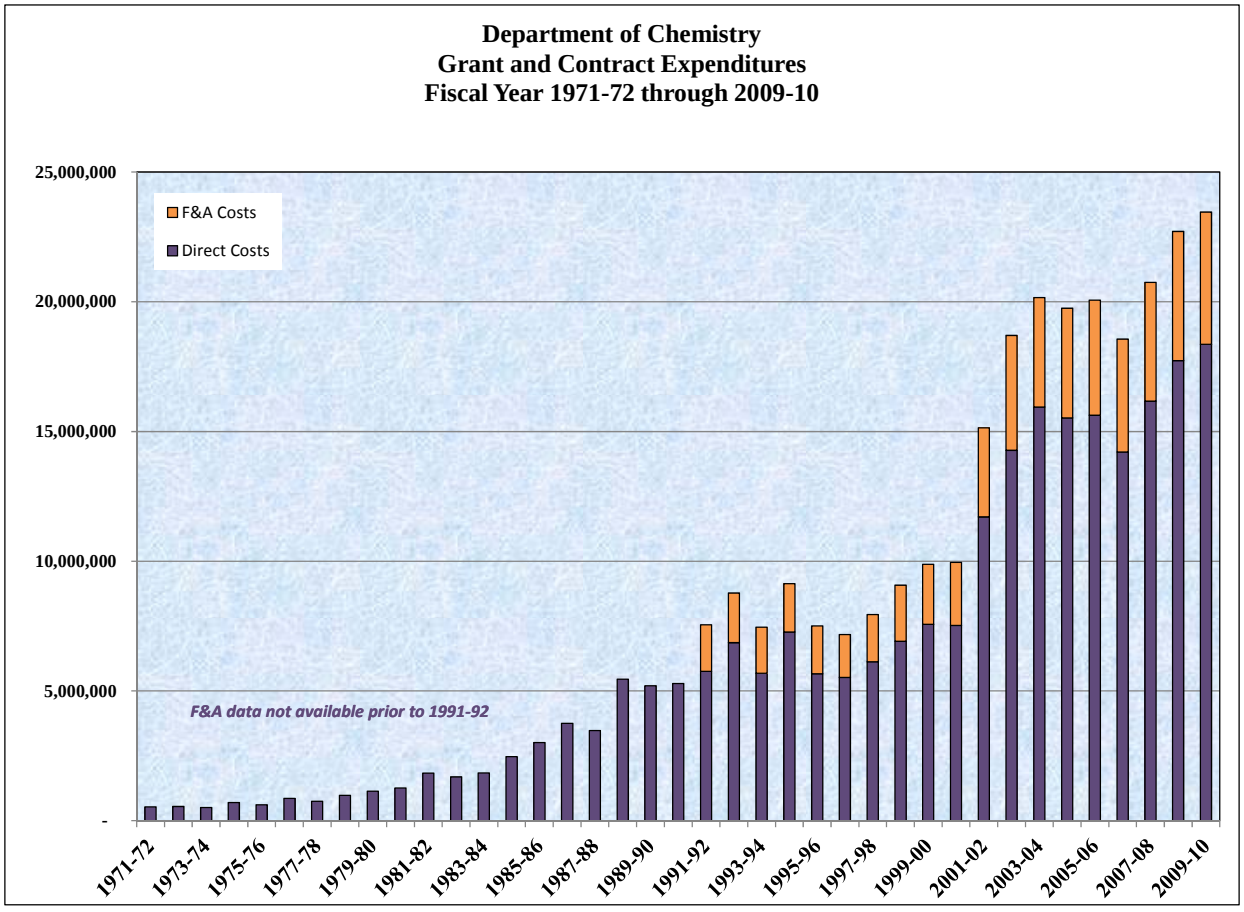


Figure IV-C. Grant and Contract Expenditures, 1971-2010.

Federally Financed R&D Expenditures in Chemistry at Universities and Colleges Ranked by FY 2009

(Dollars in thousands)

Rank	Institution	Federally financed 2006	2007	2008	2009
	All institutions	967,738	976,188	992,423	1,037,173
1	MA Institute of Technology	16,004	18,449	21,539	27,379
2	CA Institute of Technology	28,662	28,822	22,279	26,065
3	Rutgers, The State U. NJ all	17,695	16,696	16,937	25,693
4	U. IL Urbana-Champaign	16,496	19,674	20,495	21,340
5	Harvard U.	31,683	25,629	21,183	19,649
6	**Washington**	**15,243**	**15,592**	**16,955**	**18,504**
7	U. CA, San Diego	17,451	19,701	15,582	18,490
8	U. NC Chapel Hill	15,757	16,263	19,650	18,419
9	U. CO all campuses	16,842	15,084	15,892	18,387
10	Johns Hopkins U., The	11,875	15,787	18,101	17,804
11	Northwestern U.	13,767	14,785	13,645	17,260
12	U. CA, Berkeley	19,891	19,561	18,241	16,861
13	U. CA, Los Angeles	13,491	17,123	16,025	15,346
14	U. TX Austin	15,163	14,173	15,124	14,474
15	U. PA	14,892	12,182	13,026	13,745
16	Cornell U. all campuses	14,528	11,387	12,256	13,732
17	Purdue U. all campuses	9,604	12,721	15,069	13,680
18	GA Institute of Technology	10,360	11,260	12,387	13,625
19	U. MI all campuses	12,962	11,371	12,573	13,349
20	Stanford U.	12,970	13,052	15,695	13,209

Table IV-D. Top Twenty Federally Funded Non-Equipment R&D Expenditures Among U.S. Chemistry Departments, 2006-2009 (source: NSF).

3. Honors

Individual faculty members regularly receive national and international awards. Table IV-E lists a subset of such recent awards. A more complete list is found in the appended CVs of the faculty (Appendix C). We are particularly pleased that faculty members hired in recent years, through the open search process described below, have won a variety of prestigious awards including five Dreyfus New Faculty Awards, two Packard Fellowships, a Keck Young Investigator Award, two PECASE awards, an NIH Pioneer Award, and several Sloan Fellowships and NSF CAREER Awards.

Department of Chemistry Faculty
Selected Awards

Recipient	Award
Borden, Weston T.	Fellow, American Association for the Advancement of Science; American Chemical Society Cope Senior Scholar Award
Campbell, Charles T.	Fellow, American Chemical Society; Fellow, American Association for the Advancement of Science; American Chemical Society Arthur W. Adamson Award for Distinguished Service in the Advancement of Surface Chemistry; Alexander von Humboldt Foundation Research Award; American Chemical Society Award in Colloid and Surface Chemistry
Chiu, Daniel T.	Analytical Chemistry Young Innovator Award; Pittcon Conference Achievement Award; ACS Phi Lambda Upsilon National Fresenius Award; Alfred P. Sloan Research Fellowship; Keck Distinguished Young Scholar in Biomedical Research, W. M. Keck Foundation; National Science Foundation CAREER Award; Dreyfus New Faculty Award; Research Corporation Research Innovation Award
Christian, Gary D.	Honorary Member, Japan Society for Analytical Chemistry (once every 5 years)
Dalton, Larry R.	Linus Pauling Award, Oregon, Portland, and Puget Sound sections of the American Chemical Society; Fellow, Materials Research Society; Fellow, American Chemical Society; Fellow, International Society of Optical Engineers; Fellow, Optical Society of America; Fellow, American Association for the Advancement of Science; American Chemical Society Award in the Chemistry of Materials; Distinguished Alumni Award, Michigan State University
Davidson, Ernest R.	National Medal of Science
Dovichi, Norman	Pittcon Ralph N. Adams Award in Bioanalytical Chemistry; American Chemical Society Analytical Division Spectrochemical Analysis Award
Gamelin, Daniel R.	Alfred P. Sloan Research Fellowship; Camille Dreyfus Teacher-Scholar Award; National Science Foundation CAREER Award; Presidential Early Career Award for Scientists and Engineers (PECASE); Research Corporation Cottrell Scholar Award; Research Corporation Research Innovation Award
Gelb, Michael H.	Fellow, American Association for the Advancement of Science; National Institutes of Health Merit Award; Medicines for Malaria Venture Project of the Year
Ginger, David S.	American Chemical Society Colloid & Surface Science Division Unilever Award; Alfred P. Sloan Research Fellowship; Camille Dreyfus Teacher-Scholar Award; Research Corporation Cottrell Scholar Award; National Science Foundation CAREER Award; Presidential Early Career Award for Scientists and Engineers (PECASE)
Goldberg, Karen I.	NY Metro Area Outstanding Woman Scientist, AWIS
Jen, Alex K.-Y.	Fellow, American Chemical Society; Election to the Washington State Academy of Science; Fellow, International Society of Optical Engineers; Fellow, Optical Society of America; Fellow, American Association for the Advancement of Science

Table IV-E. Selected Awards of Chemistry Faculty Members, 2000-2011.

Department of Chemistry Faculty
Selected Awards

Recipient	Award
Khalil, Munira	National Science Foundation CAREER Award; Packard Fellow in Science and Engineering, David & Lucile Packard Foundation; Dreyfus New Faculty Award, Camille & Henry Dreyfus Foundation
Li, Xiaosong	Alfred P. Sloan Research Fellowship; National Science Foundation CAREER Award
Maly, Dustin J.	Alfred P. Sloan Research Fellowship; National Science Foundation CAREER Award
Mayer, James M.	Fellow, American Chemical Society
Michael, Forrest E.	National Science Foundation CAREER Award; Thieme Chemistry Journal Award
Norman, Josephus G.	Election to Oxford Round Table (UK)
Prezhdo, Oleg V.	Fellow, American Physical Society; Alfred P. Sloan Research Fellowship; National Science Foundation CAREER Award
Raschke, Markus B.	National Science Foundation CAREER Award
Rathod, Pradipsinh	Medicines for Malaria Venture Project of the Year; Molecular, Cellular, and Immunology of Parasites Award, ASTMH
Reid, Philip J.	University of Washington Distinguished Teaching Award
Reinhardt, William P.	Couper Scholar, Phi Beta Kappa
Ruzicka, Jaromir	Keller Award, European Community of Analytical Societies; Fulbright Professorship to the Czech Republic
Sasaki, Tomikazu	Named as one of the University of Washington Top 10 Inventors
Spiro, Thomas G.	Society of Porphyrins and Phthalocyanines Eraldo Antonini Lifetime Achievement Award; American Chemical Society Award for Distinguished Service in the Advancement of Inorganic Chemistry; Biophysical Society Founders Award
Synovec, Robert E.	Minnesota Chromatography Forum L. S. Palmer Award
Tureček, František	Czech Spectroscopy Society Johannes Marcus Marci of Kronland Medal; Ceska Hlava Patria Science Prize; Czech Academy of Sciences Honorary Medal
Varani, Gabriele	AAAS Cleveland-Newcombe Prize Science
Xia, Younan	National Institutes of Health Pioneer Award; Leo Hendrik Baekeland Award, North Jersey Section of the American Chemical Society; Camille Dreyfus Teacher-Scholar Award; Alfred P. Sloan Research Fellowship; National Science Foundation CAREER Award; Packard Fellow in Science and Engineering, David & Lucile Packard Foundation

Table IV-E. Selected Awards of Chemistry Faculty Members, 2000-2011 (continued).

An indication of the strength of our faculty is our having won two highly competitive center grants in the course of the past decade. Professor Larry Dalton, assisted by many faculty members inside and outside of the UW, was PI on a successful NSF Science and Technology Center grant (ca. $40M over 10 years) which started in 2001, forming the Center for Materials and Devices for Information Technology Research. Professor Philip Reid now leads this group. Professor Karen Goldberg, similarly with support from faculty members inside and outside the UW, was PI on the nation's first successful NSF "chemical bonding center" grant ($15M over 5 years), which formed the Center for Enabling New

Technologies through Catalysis (CENTC) in 2007. [In 2011, the Center for Process Analytical Chemistry (CPAC), our first NSF-sponsored center, transitioned from its traditional home in Chemistry to the UW Applied Physics Laboratory. This new home better matches the industrial sponsors' interests in applied research on industrial process analysis and control.]

Overall, we believe we have done a good job of promoting our junior faculty members for various early-career awards, and they have competed favorably for these. An area for improvement is promotion of our mid-career and more senior faculty members for national and international awards. We have in recent years increased our emphasis on the latter, resulting in several awards.

D. Faculty Recruitment and Retention

Recruitment and retention of the most highly capable faculty members are among the very most important things a department does. Success in recruitment and retention is also an indirect measure of quality. We thus devote a short section to this subject.

1. Recruitment

In 1994, our department ran our first search for several faculty members that was open with regard to research areas. Previous searches had been more targeted, seeking to replace recently lost disciplinary expertise or to advance a specific new disciplinary initiative. The rationale for open searches is that it is better to increase the size of the pool of highly capable applicants and thus the probability of an outstanding hire than to pursue narrowly defined objectives. Almost without exception, our faculty searches since have followed this model. It is a misnomer to call these searches "open", because all faculty members bring biases to the selection process. The open model simply means that in any given year a high quality candidate in any of the many areas of interest to our faculty has a chance of receiving an offer.

Open searches are more labor intensive than focused searches. The chair annually appoints more search committees than the number of positions the Dean has authorized for us to fill. The committees recognize they are competing internally to be able to hire. Each search committee is assigned by the Chair a fixed number of interview slots, typically three to six. The allocation of interview slots is a mechanism by which the Chair is able to steer hiring toward areas of more immediate need (another respect in which the searches are not truly entirely open), for example to assure our ability to cover various instructional commitments. Averaged across time, we interview some seven to ten candidates for each hire that is made.

Following interviews, the full faculty meets to determine which of those interviewed are "above the bar", in other words, that we would be pleased to hire. The faculty also advises the Chair concerning the order in which offers are to be extended. The latter is of course particularly contentious. Naturally there is concern that such a process across time could lead to an imbalanced distribution of faculty expertise. The reality is that this has not happened. We are today a smaller faculty than a decade ago, but the losses have been relatively evenly spread across the historical divisions.

At a faculty workshop in preparation for this review, we discussed the future of faculty hiring. Without objection, the faculty proposes to continue the relatively open process of the past 16 years.

2. Retention

Until the middle of the last decade, retention of our faculty was not among our most serious concerns. In a 50 year period, just a handful of outstanding faculty members had elected to depart. These included Ken Wiberg's departure to Yale, Ernest Davison's move to Indiana (where he was elected to the NAS and received the National Medal of Science), and Eric Heller's move to Harvard.

Since about 2000, and accelerating throughout the past decade, our faculty members have become increasingly attractive to others. It is a sign of the quality of our Department and the support of

our Dean and Provost, that we have retained Chemistry faculty members in the recent past who have been offered positions at the following outstanding institutions: Cornell, Yale, Illinois, Penn State, Michigan, UT Austin, Caltech, Scripps and Georgia Tech.

The downside of having an outstanding faculty is that not all of them are being retained. During the past decade we have lost eight faculty members to competing academic institutions. No single theme accounts for these losses, though perhaps half of these did commence due to dissatisfaction over faculty salary levels. Some of these losses are particularly damaging to us, particularly the losses of those with the most visible programs nationally or internationally. We count among these the losses of Weston Borden, Norman Dovichi, Oleg Prezhdo, and Younan Xia (whose citation record at the UW from 2000-07 recently won him the distinction of being among the top few materials scientists of the past decade).

E. Challenges

We describe here challenges facing the faculty in their work, and the challenges facing UW in building and maintaining the Chemistry faculty.

1. Challenges Facing the Faculty

In the execution of their undergraduate instructional mission, the number one challenge facing the faculty is very clearly the result of rising student numbers and declining resources. This has meant that each faculty member faces more students in the lecture hall or lab, and in selected cases the faculty member is provided fewer TAs per student. As mentioned in Chapters I and II of this document, the consequences of this are many. In some cases faculty members exhaust themselves trying to continue to provide "full service" by not reducing what is provided to each student in the form of one-on-one contact, grading, etc. The Department attempts not to allow faculty to exhaust the TAs, but instead asks faculty members to adjust their course organization to allow the TA workload to remain reasonable, even when the number of students per TA has doubled (as in CHEM 142, 162, and 241).

Our vision calls for an environment in which "faculty, staff, and students will view study or a career in the Department of Chemistry at the UW as a highly attractive choice." Inadequate support for instruction does not constitute such an environment. It negatively impacts the learning of students and career experience of faculty and staff.

The weak instructional budget leads, indirectly, to the major challenge (relative to off campus peers) facing faculty in executing their graduate instruction, postdoctoral mentoring, and research mission. Inadequate resources for undergraduate instruction require that faculty members divert time that they would otherwise spend in scholarly activities and in raising research funds to support their work. Furthermore, TA support for graduate students, which allows research groups to be larger and thus more productive, is a form a support for research that is demanded by the marketplace for chemistry faculty nationwide. Our faculty members on average each have about one fewer graduate student in their research group relative to their off-campus chemistry peers as a result of our inadequate TA budget.

The solution to both of these challenges is clear: We need to provide peer level resources in the form of a faculty and TA count that is aligned with the scale of our undergraduate instructional program.

2. Challenges Facing the UW in Building and Maintaining a Chemistry Faculty

The winning formula for an outstanding department is to hire the best faculty candidates and then support them. Doing each of these well reinforces our ability to do the other (candidates are more likely to accept at a department perceived as supportive; faculty feel supported by an environment able to recruit high quality new colleagues).

When recruiting top quality faculty candidates, the primary challenge is start-up funding. The marketplace for starting Assistant Professors in Chemistry (other than theorists) demands a start-up package of in the range of $750,000 to $1.1M for excellent candidates. Each year, a few candidates nationally are "anointed" and the competition for them includes offers of $1.5M or more! Current practice at the UW is for departments to pay 1/3rd of start-up costs. All units are struggling with this cost, which puts department chairs in the position of deciding whether to allocate precious department funds to the support of current faculty and students or to fund new hires. Neither choice will allow for a successful department in the long run for the reason expressed in the opening sentence of this section.

A secondary challenge that faces UW in building and maintaining a Chemistry faculty involves the faculty compensation system. The experience of UW faculty in this respect still varies considerably by school/college and by department; Arts and Sciences has a long history of paying faculty members below-peer-level salaries on average. At the moment, average salaries by faculty rank in the Department of Chemistry are comparable to our public peers, after decades of being behind or far behind. This is the result of unit adjustment funds, deployment of some endowment funds (currently about 3% of our tenure track faculty salary base is covered by endowment funds), retirements of some very low-salary individuals, and some key retention raises. This problem could quickly reemerge if, as our former Provost Phyllis Wise commented, we do not "keep our eye on the ball".

3. Challenges Facing the UW in Meeting Chemistry Research Space Needs

High-quality research laboratory space (wet and dry lab) and office space, all in adequate quantity, are a critical infrastructural requirement for an outstanding chemistry department. We face challenges from both the quality and quantity perspectives. Table IV-F presents our current total space assignment across three building, Bagley Hall (BAG), Chemistry Building (CHB) and the Chemistry Library Building (CHL).

Data provided by off campus peers indicate that about 2,200 assignable square feet (asf) of laboratory space per tenure track faculty member is a national norm. UW Chemistry presently has a space portfolio of about 74,000 asf of laboratory space, distributed over three buildings – Chemistry Building (29,735 sf), Bagley Hall (33,743 sf), and Chemistry Library Building (7,383 asf, including the newly completed renovated space). This leaves us about 14,000 asf short of space of meeting the needs of a tenure line faculty of 40.

The shortfall is almost exclusively in the area of dry lab spaces: despite the recent addition of some 3,000 asf of dry lab in the Chemistry Library Building, in the former Chemistry Library, we remain about 10,000 asf short of dry lab spaces. In other words, the current dry lab portfolio of about 25,000 asf will need to be expanded to about 35,000 asf total in due course. The new spaces will ideally have relatively low ambient vibration and a relatively high level of temperature control, ca. $\pm$ 1^{o}C at a given point in the lab. We acknowledge that the more favorable situation in both the quality and quantity of wet lab spaces is the result of a very significant investment by the UW over the past decade, primarily on the Bagley 3rd and 4th floors.

The optimal solution to the dry lab space shortfall is unclear. One option would be for Chemistry to be assigned ca. 10,000 asf of dry lab space in the new Molecular Engineering Building, or in a subsequent addition to that structure. [Present plans for this space are ambiguous with regard to both "rental" cost and duration of assignment, reducing the attraction of this space.] Another alternative would be new construction on building sites proximal to the current Chemistry space portfolio. The latter is unlikely in the near term given budgets and competing on-campus space needs.

The quality of both laboratory and office spaces in the relatively new Chemistry Building (opened Spring 1994) is relatively high. In contrast, many spaces in both Bagley and Chemistry Library Building remain in need of investment to improve research utilities (e.g. N_2 line, cooling water, electrical circuits, etc.). The most disruptive shortcoming of Bagley and Chemistry Library laboratories is the lack of temperature control. Stretches of unseasonably hot or cold weather in the Spring or Fall disrupt

research. Depending upon on the heat load of the room, these disruptions can render modern scientific equipment dysfunctional.

We hope that the review committee will recommend continuation of the program of renovations and new spaces to assure Chemistry has research spaces available in sufficient quality and quantity.

Department of Chemistry
Assigned Space

Category	Bag	CHB	CHL	Total
Administrative	8,217	1,591	2,921	12,729
Cell Culture Lab	876			876
Chemical Storage	1,431	2,231		3,662
Cold Room	411	645		1,056
Conference Room	782	1,358	240	2,380
Dry Lab	9,763	11,239	5,459	26,461
Faculty Offices	6,434	3,766	1,212	11,412
Lounge	648			648
Research Offices	19,323	4,793	2,788	26,904
Research Storeroom	2,972			2,972
Research Support	3,459	750	128	4,337
Shop/Instruments	13,811			13,811
Storage	1,917		241	2,158
Study Center	2,471			2,471
Teaching Lab	27,173	8,851		36,024
Wet Lab	26,980	18,496	1,924	47,400
Total	**126,668**	**53,720**	**14,913**	**195,301**

Table IV-F. Department of Chemistry Space Portfolio.

F. Rebuilding the Faculty: Research Initiatives

Chemistry is the science that studies matter, the stuff of which all things are made. Chemists study the composition, structure, properties, and reactions of matter on the molecular scale and larger. Chemists also discover and synthesize entirely new materials. Modern chemistry touches on many other fields of science, engineering, and medicine. As our faculty turns over, there is a tension with each new addition between hiring to assure breadth of coverage as opposed to building clusters of strength. Our approach to this problem under the open hiring model has been opportunistic: In each search cycle we allow the expertise of the most outstanding faculty candidates we are able to identify to determine our course. We believe this process has served us well.

Our research programs have made a great many contributions in the past decade, detailed in hundreds of research publications. Some of these reports appear in high profile journals; for example, our faculty members have collectively published one or two papers per year in *Science* during the last decade. A few publications are extremely high profile, as in Younan Xia's 2002 *Science* paper describing the synthesis of gold and silver nanocubes that has already been cited over 2000 times. Similarly, the 1999 report from Gelb, Tureček, *et al.* in *Nature Biotechnology* describing ICAT (isotope-coded affinity tag) reagents for analysis of protein mixtures has been cited over 2600 times. Our research ranges from the fundamental, the implications and applications of which might presently be not at all clear, to the applied, with the potential for immediate impact. In the interest of brevity, we highlight just three

developments in the course of the past decade, in each case with some relevance to our plans for future research emphasis areas:

- **Biological Chemistry.** Research in the Department of Chemistry relevant to biology ranges from the fundamental to immediately applicable. During the past decade, Professors Michael Gelb and František Tureček in Chemistry and their collaborator Dr. Ronald Scott of Children's Hospital in Seattle developed the first practical multiplex method for screening newborns for nine lysosomal strorage diseases, including Fabry, Gaucher, Krabbe, Niemann-Pick, and Pompe diseases. On the one hand, these diseases are debilitating for their carriers, who can greatly benefit from early diagnosis and the resulting therapy. On the other hand, these diseases are extremely rare. For that reason the false positive rate and the cost per assay must both be extraordinarily low. Their method uses tandem mass spectrometry to detect the products of several enzymatic reactions directly from newborn blood samples. One of the images on the cover of this report is the source of such a blood sample. Organic synthesis is used to generate a series of substrates that are specific for each enzyme and that provide maximum sensitivity of detection. This assay is now mandated by law for all newborns in New York, Austria and Taiwan. Implementation is anticipated very soon in California and Illinois. Pilot studies are being carried out worldwide to enable newborn screening programs to expand to include lysosomal storage diseases. By the time of our next review, it is possible that every newborn in the United States will be screened by this method or some successor of it. This work demonstrates the extraordinary potential of linking organic synthesis, enzymology, and analytical chemistry to address an important societal need.

- **Catalysis.** Research in the field of catalysis seeks to understand the detailed mechanisms by which catalysts accelerate chemical reactions and the discovery of new catalysts for known or even previously unknown reactions. The research can be fundamental in nature, or targeted to a specific application. In the latter category is the development of catalysts with potential utility in the development of alternative energy sources. One such application is the invention of catalysts of use in the conversion of solar energy into storable chemical fuels, such as hydrogen (H_2) by the splitting of water. One step in this process is the removal of electrons from water to create oxygen. Unfortunately, current methods for carrying out this reaction are inefficient and require rare and thus expensive metals such as platinum. The discovery of better catalysts for making oxygen will give us valuable tools towards the development of usable alternative energy sources. Professors Karen Goldberg and James Mayer have collaborated to develop a new electrocatalyst that converts water to oxygen gas, which is an important process for the production of new chemical fuels including hydrogen. The new catalyst is water soluble, self-assembles quickly in water, and is based on copper, which is abundant and inexpensive. Although this catalyst requires a relatively large amount of energy to convert water to oxygen, it is one of the fastest soluble oxygen evolving catalysts discovered to date. One image on the cover shows oxygen being created by this catalyst.

- **Materials Related Chemistry.** Over the past decade, researchers in the Center on Materials and Devices for Information Technology Research (CMDITR) have been developing organic and mixed organic/inorganic ("hybrid") materials for a variety of photonic applications including information transfer, light-emitting devices, and photovoltaics. One significant accomplishment of CMDITR is the development of organic electro-optical materials that provide a 20-fold improvement in information transfer rates relative to materials (i.e., lithium niobate) currently in use commercially. This achievement required the development and utilization of multiscale theoretical methods as well as the development of novel material characterization techniques.

These efforts have resulted in the identification and characterization of new phases of organic electroactive materials (associated with extended molecular cooperativity and reduced lattice dimensionality) enabling this dramatic improvement in electro-optical performance. The leadership of CMDITR in the development of organic electro-optic materials has been recognized by 6 high profile journal cover articles and was featured as one of the key advances in C&E News “Decade in Review (2000-2010)”. The central cover image depicts oriented electrooptic chromophores with electrostatic surface charges color encoded.

In preparing for this review, our faculty discussed in broad terms the areas in which we would prefer to focus future hiring. We sought to identify areas that are intellectually challenging, that will build on our own existing strengths, yet contribute to the success not just of UW Chemistry but also to other units within the UW, that address large-scale issues of potentially large societal relevance, and that are consistent with preparing students for future employment and in meeting workforce needs. And it is a practical reality that we must select fields in which we anticipate long-term opportunities to obtain substantial levels of extramural funding.

The experiences of the last decade suggest two broad areas which are likely to meet these many criteria: research that will contribute to improved human health or to improved national security. Within these two areas, we have picked the following three major research themes:

- Measurement, modeling, and manipulation of chemical and biological systems
- Energy, sustainability, and catalysis
- Materials chemistry and nanotechnology

These areas clearly satisfy all of the criteria described above. We note that each of these themes allows facile alignment of the Department's research priorities with those of our on-campus resource centers, and local off-campus resources such as the Fred Hutchinson Cancer Research Center, Amgen, Boeing, etc., as well as regional national lab resources like the Environmental Molecular Sciences Laboratory (EMSL) at the Pacific Northwest National Laboratory (PNNL). Collaborations with researchers associated with each of these resources will therefore be strengthened.

1. Measurement, modeling, and manipulation of chemical and biological systems

In the coming decades, biology will likely undergo a transition from being a qualitative and correlative science into a quantitative and predictive discipline. The transition will only be possible with new tools provided by chemists who are "makers" (of new substances, classically inorganic and organic chemists) and "measurers" (analytical and physical). For example, new instrumental tools will be necessary for making precise and quantitative chemical and biological measurements. Advances in this area are possible only with iterative interactions between the chemical and the biological sciences. Data obtained in these quantitative measurements must be managed, modeled, and interpreted, feats that will require integrating mathematical analyses common in the physical sciences into a context that is relevant to the chemical and biological questions under study. Chemistry is a discipline that is experienced in dealing with complex systems in quantitative frameworks, and chemists have much to contribute to this area. In addition to making precise and quantitative measurements, it is equally important to develop tools that are capable of manipulating and perturbing biological systems in a controlled and predetermined manner. Such tools may be chemical or physical in nature, such as design of molecules that target specific signaling proteins, or optical techniques that can address individual molecules in cells with high spatiotemporal control. This direction is envisioned as supporting growth for years to come. UW has a strong biomedical research enterprise and Chemistry is well positioned to address these emerging areas and needs, to engage the UW biomedical community, and to assume a leadership role in pushing the boundaries of this new frontier.

2. Energy, sustainability, and catalysis

Energy and sustainability are arguably the greatest technological challenges facing our society today. Our ability to provide for the energy needs of our growing human civilization has broad implications encompassing climate, national security, economic growth, food, water, and global health considerations. The importance of these challenges is recognized not only by current and prospective students and postdoctoral trainees, but also by federal and private funding agencies, our alumni, and more broadly by the local, regional, and national communities we serve. Research in chemistry is essential to tackling the challenges of energy and sustainability: chemistry provides the basis for the discovery of new compounds and materials formulations that could make solar power economical; the design of new industrial catalysts that could enable chemical transformations with less energy, waste, and pollution; and the development of better materials and methods for storing renewable energy in batteries and as chemical fuels. Chemical discoveries even have the potential to improve energy efficiency in lighting, refrigeration, telecommunications, and computing. Over the last decade UW Chemistry faculty have established leading programs in areas such as low-cost solar energy, and have led a major NSF center in the area of catalysis (CENTC). In the future, strategic faculty hires in synergistic areas will strengthen our competitiveness for major federal funding for collaborative initiatives. We will need to compete with institutions that are making major investments of state and/or philanthropic resources in these areas. Raising the profile of the UW in this area will require not only active collaboration among chemists, but also close collaboration with physicists, materials scientists, electrical engineers, and other disciplines.

3. Materials chemistry, with emphasis on nanotechnology

A strong research profile in materials chemistry and nanotechnology will be integral to the success of each of the research areas discussed above, as well as to many other parallel efforts. Materials chemistry and nanotechnology are highly interdisciplinary research fields in which chemists play central roles. Materials chemists are deeply involved in the design, synthesis, characterization, and manipulation of new materials that possess unusual structural, physical, or other functional properties. Frontier research is often concerned with properties or effects at nanometer length scales, and the development of technologies exploiting such properties or effects. Examples include inorganic semiconductor nanostructures for solar energy conversion, organic chromophores for nonlinear optics, nanoelectrodes for DNA sequencing, and designer bio-interfaces. The new materials and insights that emerge from this research will impact future energy conversion technologies, information processing technologies, and bio-technologies, and will undoubtedly spawn new technologies that are largely unimaginable today.

Materials chemistry and nanotechnology have grown to become major strengths at UW. Research in materials chemistry and nanotechnology in the Department of Chemistry has major emphases in nanostructures, heterogeneous catalysis, photonics and optoelectronics, surfaces and interfaces, computational modeling and dynamics, biomimetics, and lithographic patterning for applications in biotechnology, chemical sensing, and microfluidics. According to a recent Thompson-Reuters analysis, UW led the world in citation impact for materials science research from 2001-2011, with chemistry faculty contributing substantially to this tremendous distinction. Their research efforts are bolstered by strong ties between Chemistry and allied departments in the Colleges of Arts and Sciences (Physics) and Engineering (Bioengineering, Chemical Engineering, Electrical Engineering, and Materials Science and Engineering) at the UW. They benefit also from sophisticated campus resources (associated with the Center for Nanotechnology, the Science and Technology Center for Materials and Devices in Information Technology Research (CMDITR), the Washington Technology Center, the Molecular Engineering and Science initiative), and close ties with nearby Pacific Northwest National Laboratories. Federal support for materials research continues to be robust. Building upon these

strengths in materials chemistry and nanotechnology is therefore a priority for Chemistry in the coming decade.

The Department will continue its aggressive pursuit of distinction as an elite research institution, competitive at all levels with the top chemistry departments worldwide. This effort will involve parallel development of our faculty research profile, our student/postdoc profile, and the effectiveness with which our departmental infrastructure enables execution of world-class research.

G. Conclusion

The faculty team presently in Chemistry is extraordinarily strong. Our tenure track faculty is among the top ten chemistry faculties in the nation at winning grant and contract funds. They achieve this remarkable distinction while overseeing the largest undergraduate degree granting program in our field in the nation. Their research and instruction programs are both highly regarded.

At the same time, the failure of our instructional budget to grow—indeed it has fallen—has come at a particularly unfortunate moment, as our instructional program grew to record size. This leaves our faculty challenged to assure student-learning at peer-levels and simultaneously to maintain their scholarly programs. We ask the review committee to affirm our plan to rebuild our faculty count to 40 FTE and to increase our TA count to 120 during the academic year. In rebuilding our faculty, we will emphasize research that holds the greatest promise for improving human health and security. We believe a future that includes all of these would be extraordinarily bright.

Chapter V
A Vision for 2020

A. The Vision

The opening pages of this document include a vision for this Department in the year 2020 containing six items. In this section we briefly state why each of these vision statements is important and realistic.

Our research and instructional programs will be comparable in quality to the very best at leading U.S. public research intensive institutions. In due course, these programs will be recognized nationally and internationally as such.

Almost all of the resources that support our instructional and research programs are provided from either tax-derived public resources (federal grants and contracts, state allocation) or student-derived tuition. It is our obligation to provide the highest quality programs achievable with the available resources, in order to maximize our contributions to society and to individual students. With a resource base comparable to our public peers, there is no reason we should not be among the very best. In time, we should expect increasingly to be recognized for excellence nationally and internationally.

The achievements of our students and postdoctoral associates will be limited only by their individual potential. They will compete favorably for subsequent study or employment in the academy, industry, or government.

Today, the experiences of our undergraduate students, graduate students, and postdoctoral associates are all being negatively impacted by a resource base mismatched to our undergraduate program size. The very best undergraduate students do not have honors coursework of a kind that stretches them to their limits; the weakest fall through the cracks. Graduate students serving as TAs are diverted from their own scholarly activities by the high number of students they encounter in the classroom or laboratory. Our graduate students also have a very limited portfolio of graduate courses in Chemistry from which to choose. Postdoctoral associates have less contact with their faculty sponsor, whose time is diverted from research by high student numbers in the courses they teach.

Our proposal is that with peer level resources we can do much better in all of these areas. Under those circumstances, we expect our students and postdoctoral associates to compare and compete favorably with the best in their future activities.

Our research programs will advance the frontiers of knowledge, and address societally critical needs, particularly in the areas of biological chemistry, catalysis and sustainability, and materials chemistry. We will be recognized as key research collaborators by many units at the UW.

By focusing future hiring largely, but not exclusively, in the strategic areas described in Chapter IV, we hope to maximize the probability that our research will contribute to meeting societal needs and to prepare our students for a lifetime of contribution. As the "central science" we anticipate that our strength in this area will help other units at the UW to prosper.

We will be a community of faculty, staff, and students with diversity as a core value. The face of our department will reflect the face of America.

We will continue to search broadly with regard to area in every round, and to include diversity as a consideration in faculty hiring decisions. In both our student and faculty populations, we will continue efforts to increase involvement of all underrepresented groups.

Our budget will be sufficient in size to allow us to admit all academically qualified undergraduate students at the UW wishing to study toward our bachelor's degrees, to admit and support graduate students sufficient in number to maintain critical mass in our research programs, and to support the infrastructure of equipment and spaces required for modern instruction and research in the chemical sciences.

A decade ago, we were an "open" major: any student desiring to do so could take our courses and thus work toward our degrees. Today, we are a "competitive entry" undergraduate program, allowing us to admit or to turn away students based upon their academic qualifications as well as resource limitations. We seek a future in which only the former needs to be considered, by virtue of having a resource base that allows us to offer enough courses at all levels to provide timely access to our classes for all students qualified to study toward chemistry or biochemistry undergraduate degrees. This vision is consistent with national goals to encourage STEM degree production.

In this intellectually vibrant and welcoming environment, faculty, staff, and students will view study or a career in the UW Department of Chemistry as a highly attractive choice.

All indications are the UW Chemistry is well on the way to achieving this vision: faculty, staff, and students all report generally favorable experiences in our Department. But the last decade, in which eight Chemistry faculty members quit their employment at the UW in favor of employment at another academic institution, and in no case to an institution or department of appreciably superior national standing, suggests there is room for progress. We believe the improvements in instructional and research programs that will become possible with peer level instructional budgets will improve our recruitment and retention of faculty members and will move us that much closer to this vision.

B. Conclusion

The Department of Chemistry at the University of Washington has experienced a remarkably successful decade. Demand for our undergraduate instructional program is at record high levels; we are generating more bachelor's degrees annually than any other chemistry department in the nation. Our research program is among the top ten in the nation by the measure of competitively won federal grants and contracts. Our highly recognized contributions range from the fundamental to the applied.

But there are storm clouds on the horizon: The institutionally provided budget that supports our faculty, TAs, and staff is no match for the scale of the undergraduate instructional program. As described in this document, our classes are too large, with students waiting outside the door. Our course offerings are "bare bones". Each TA has too many students. We are not providing a nationally competitive student experience. And in doing the best we can by each undergraduate student, we in turn overwork our faculty and TAs, putting our research program and the quality of graduate education at risk.

In the past, it may be that this is all the UW could afford. We hope for a different future: By the Fall 2014, the Board of Regents of the UW will presumably for the fourth time have exercised its resident undergraduate tuition setting authority. It is possible that for first time in decades, UW undergraduates will then be paying tuition at the same rate as students at the best public institutions in the nation. These students deserve a peer level education. We are asking the review committee to

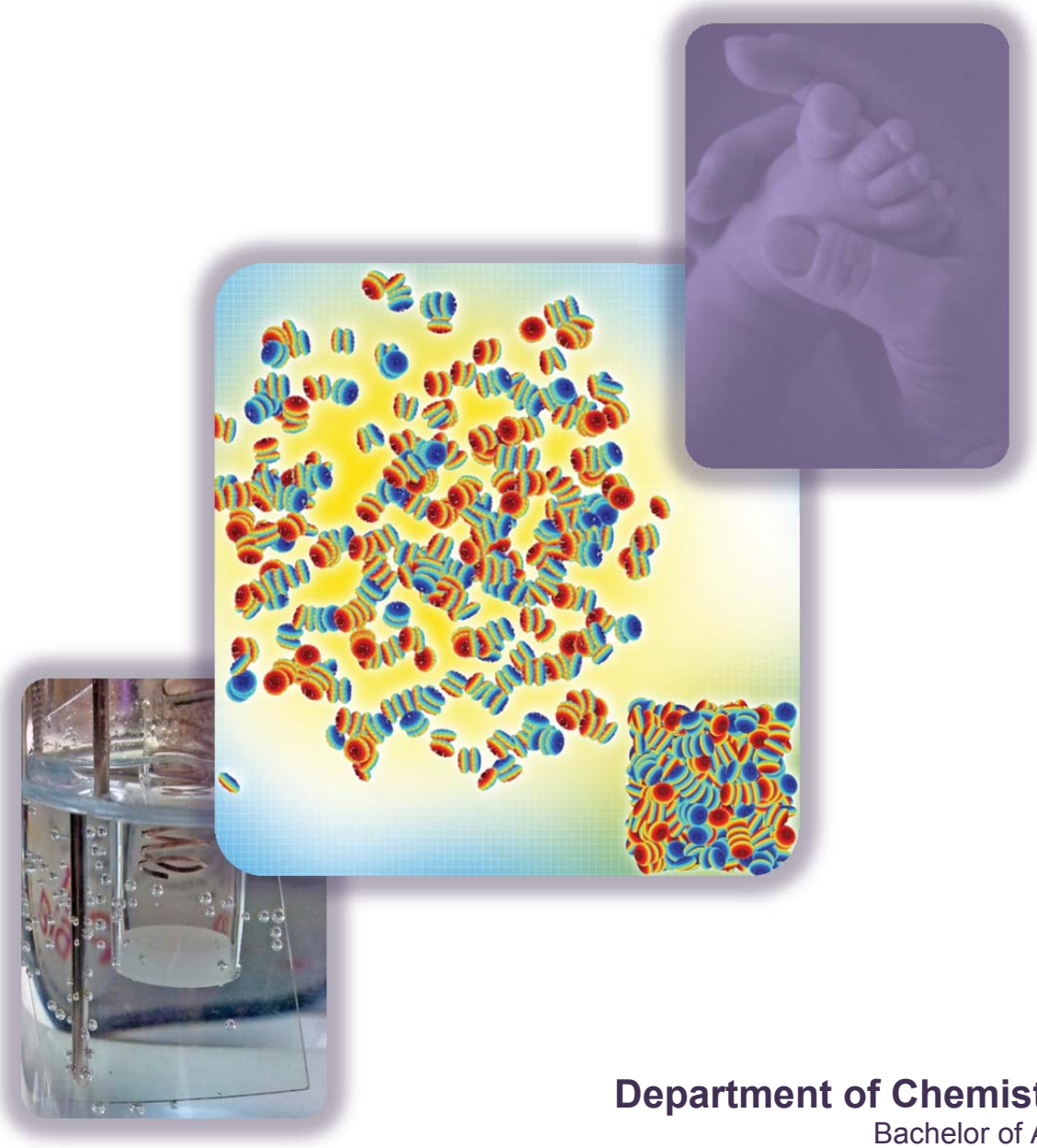
advise our administration on what is the proper level of centrally provided resources for Chemistry under those circumstances.

We have documented herein a very significant shortfall in resources available to this academic unit to accomplish our instructional mission. We believe this circumstance is not uncommon at the UW in other programs like ours that are charged with the delivery of large undergraduate instructional programs, though our problem is made more acute by the extraordinary growth in our program. In our case, the size of the shortfall is comparable to the sums that are likely to become available through tuition increases. We have presented plans for investment of these funds to remedy deficiencies in our programs.

We ask the review committee to endorse our plan. We thank the committee for its consideration.

University of Washington | College of Arts & Sciences

Academic Program Review Appendices



Department of Chemistry

Bachelor of Arts
Bachelor of Science
Masters of Science
Doctor of Philosophy

August 2011

Cover

Lower Left: One promising method for the conversion of solar energy to a storable fuel is the production of hydrogen gas by the splitting of water. A key step in that process is the removal of electrons from water, to form oxygen gas. Currently available catalysts for this process involve expensive metals. Goldberg, Mayer, et al. have invented a highly efficient and inexpensive copper electrocatalyst for this process. This image shows oxygen evolution by this method.

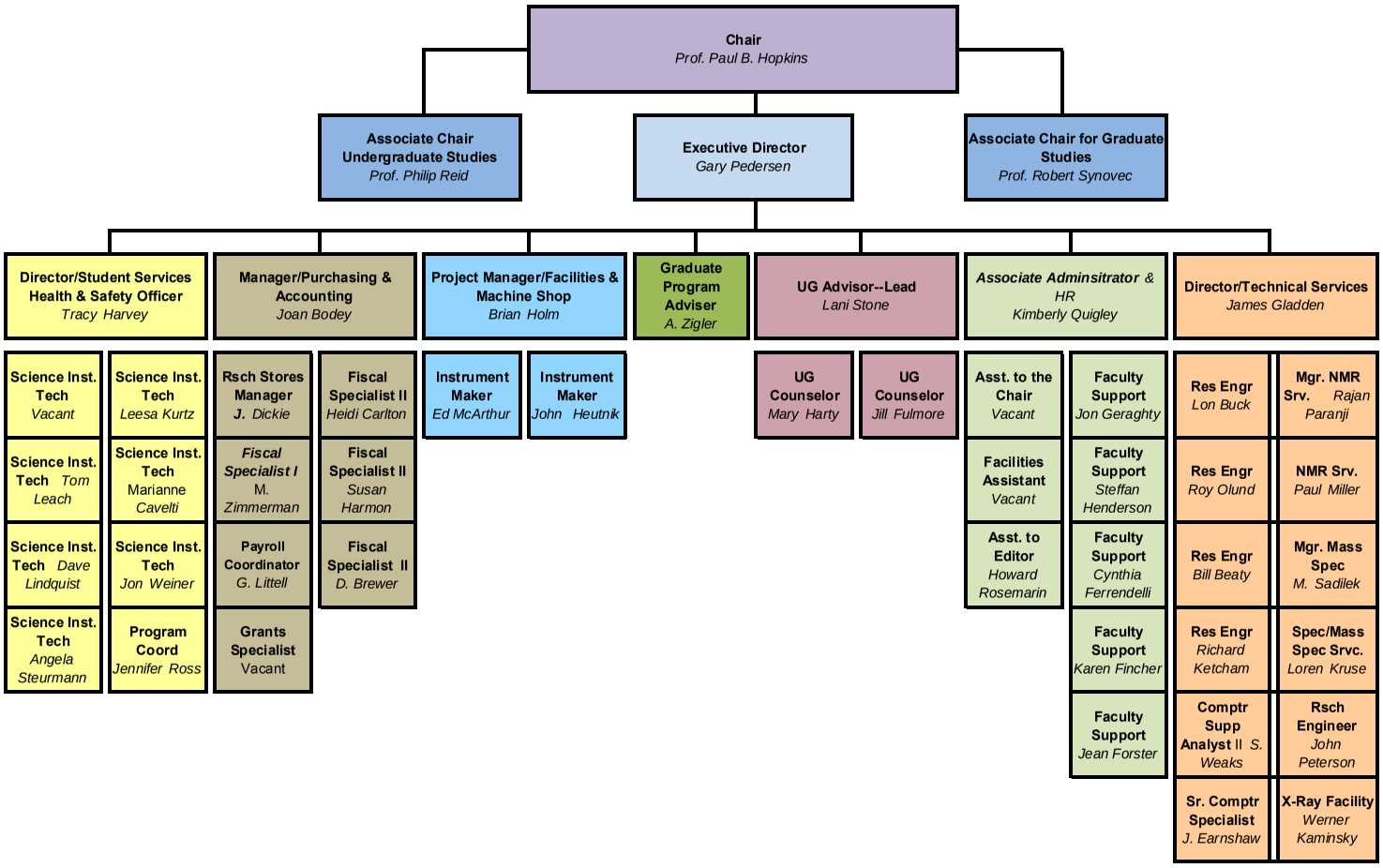
Middle: Electrooptic materials are useful for the interconversion of electrical and optical signals. One goal of the Center for Materials and Devices for Information Technology is the creation of low cost electrooptic modulators with a very low drive voltage using oriented organic chromophores. This image shows the results of a simulation of the orientation of organic electrooptic chromophores (the electrostatic surfaces of which are represented by colors) at low and high number density.

Upper Right: The lysosomal storage diseases are a family of genetic diseases with catastrophic consequences for the carriers and for which practical screening methods were until recently unavailable. Gelb, Turecek, and Scott have invented a low cost multiplex assay for enzymatic activities that can be used to detect these diseases. Their method is now being adopted as a routine tool for infant screening around the world. The image shows the standard source of the blood sample used in this assay.

TABLE OF CONTENTS

APPENDICES

University of Washington
Department of Chemistry
Organizational Chart



Department of Chemistry
UW-Provided Funding
Pervious Three Biennia

	2005-07 Biennium		2007-09 Biennium		2009-11 Biennium	
	2005-06 Fiscal Year	*2006-07* Fiscal Year	*2007-08* Fiscal Year	*2008-09* Fiscal Year	*2009-10* Fiscal Year	*2010-11* Fiscal Year
Faculty Salaries	3,615,875	3,901,077	4,080,744	3,919,514	3,919,519	3,749,952
TA Salaries	1,406,532	1,607,431	1,677,606	1,538,386	1,476,890	1,486,772
Staff Salaries	2,167,044	2,349,352	2,299,765	2,084,274	1,981,842	2,053,446
Total Salaries	**7,189,451**	**7,857,860**	**8,058,115**	**7,542,174**	**7,378,251**	**7,290,170**
Supplies and Services	90,477	69,850	75,303	182,198	363,361	382,486
Supp & Serv A&S Temp	226,454	181,163	181,163	181,163		
Total Operations	**316,931**	**251,013**	**256,466**	**363,361**	**363,361**	**382,486**
State Budget	**7,506,382**	**8,108,873**	**8,314,581**	**7,905,535**	**7,741,612**	**7,672,656**
Indirect Cost Return	1,019,318	1,094,856	1,056,540	1,107,721	1,223,796	1,237,019
Total Budget	**8,525,700**	**9,203,729**	**9,371,121**	**9,013,256**	**8,965,408**	**8,909,675**

Includes temporary funding when it is allocated consistently (e.g., temporary TA funding).

Department of Chemistry
Faculty List (Autumn 2010 - Summer 2011)

Faculty Name	Faculty Rank	Affiliations
Tenure Line Faculty		
Andersen, Niels H.	Professor	
Boydston, Andrew J. (A.J.)	Assistant Professor	
Campbell, Charles T.	Professor	Chemical Engineering, Physics
Chatterjee, Champak	Assistant Professor	
Chiu, Daniel T.	Professor	Bioengineering
Dalton, Larry	Professor	Electrical Engineering
Drobny Gary P.	Professor	Physics
Gamelin, Daniel R.	Professor	
Gelb, Michael H.	Professor	Biochemistry
Ginger, David S.	Professor	Physics
Goldberg, Karen I.	Professor	
Heinekey, D. Michael	Professor	
Hopkins, Paul B.	Professor	
Jen, Alex K.-Y.	Professor	Materials Science (Joint)
Jenekhe, Samson A.	Professor	Chemical Engineering (Joint)
Keller, Sarah L.	Professor	Physics
Khalil, Munira	Assistant Professor	
Kovacs, Julia A.	Professor	
Lalic, Gojko	Assistant Professor	
Li, Xiaosong	Assistant Professor	
Maly, Dustin J.	Assistant Professor	
Masiello, David J.	Assistant Professor	
Mayer, James M.	Professor	
Michael, Forrest E.	Associate Professor	
Raucher, Stanley	Professor	
Rathod, Pradipsinh	Professor	Sphcm Dgh Proviso
Reid, Philip J.	Professor	
Reinhardt, William P.	Professor	Physics
Robinson, Bruce H.	Professor	
Sasaki, Tomikazu	Professor	
Synovec, Robert E.	Professor	
Turecek, Frantisek	Professor	
Varani, Gabriele	Professor	Biochemistry (Joint)
Zhang, Bo	Assistant Professor	

Research Faculty		
Burgess, Lloyd	Research Professor	
Kaminsky, Werner	Research Associate Professor	

WOT Faculty		
Spiro, Thomas G.	Professor	
Davidson, Ernest R.	Professor	

Department of Chemistry
Faculty List (Autumn 2010 - Summer 2011)

Faculty Name	Faculty Rank	Affiliations
Adjunct Faculty		
Bruce, James	Adjunct Professor	Genome Sciences
Goodlett, David	Adjunct Professor	Medicinal Chemistry
Klevit, Rachel E.	Adjunct Professor	Biochemistry
Krohn, Kenneth A.	Adjunct Professor	Radiation Oncology
Murray, James	Adjunct Professor	Oceanography
Olmstead, Marjorie A.	Adjunct Professor	Physics
Parson, William W.	Adjunct Professor	Biochemistry
Stenkamp, Ronald E.	Adjunct Professor	Biological Structure/Biochemistry
Stuve, Eric M.	Adjunct Professor	Chemical Engineering
Yager, Paul	Adjunct Professor	Bioengineering
Affiliate Faculty		
Ahmed, Takiya	Affiliate Assistant Professor	Dow Chemical Company
Baer, Donald	Affiliate Professor	Pacific Northwest National Laboratory
Carlson, W. Brendan	Affiliate Assistant Professor	Seattle Polymer Company
Chambers, Scott	Affiliate Professor	Pacific Northwest National Laboratory
Dovichi, Norman	Affiliate Professor	University of Notre Dame
Grate, Jay	Affiliate Professor	Pacific Northwest National Laboratory
Haight, Gilbert, Jr.	Affiliate Professor	University of Illinois
Kahr, Bart	Affiliate Professor	New York University
Kay, Bruce	Affiliate Professor	Pacific Northwest National Laboratory
Peden, Charles	Affiliate Professor	Pacific Northwest National Laboratory
Phelan, Gregory	Affiliate Associate Professor	State University of New York–Cortland
Quinn, Patricia	Affiliate Professor	National Oceanic and Atmospheric Administration
Raschke, Markus	Affiliate Associate Professor	University of Colorado–Boulder
Simon, Julian	Affiliate Associate Professor	Fred Hutchinson Cancer Research Center
Sullivan, Philip	Affiliate Assistant Professor	Intellectual Ventures Management, LLC
Varanasi, Usha	Affiliate Professor	Northwest Fisheries Science Center
Emeritus Faculty		
Brodsky, Anatol	Research Professor Emeritus	
Callis, James B.	Professor Emeritus	
Charlson, Robert	Professor Emeritus	
Christian, Gary D.	Professor Emeritus	
Dalton, Larry R.	Professor Emeritus	
Engel, Thomas	Professor Emeritus	
Epiotis, Nicholas D.	Professor Emeritus	
Floss, Heinz	Professor Emeritus	
Gammon, Richard H.	Professor Emeritus	
Gouterman, Martin	Professor Emeritus	
Halsey, George D.	Professor Emeritus	
Hendrickson, Stewart	Professor Emeritus	
Kowalski, Bruce R.	Professor Emeritus	
Kwiram, Alvin L.	Professor Emeritus	
Macklin, John	Professor Emeritus	
Norman, Josephus G.	Professor Emeritus	
Rabinovitch, B. Seymour	Professor Emeritus	
Raucher, Stanley	Professor Emeritus	
Rose, Norman J.	Professor Emeritus	
Ruzicka, Jaromir	Professor Emeritus	
Schubert, Wolfgang M.	Professor Emeritus	
Schurr, J. Michael	Professor Emeritus	
Vandenbosch, Robert	Professor Emeritus	
Woodman, Darrell J.	Professor Emeritus	
Zoller, William	Professor Emeritus	

Tenure-Line and Research Faculty
Short CVs

Assistant Professors

Boydston
Chatterjee
Khalil
Lalic
Li
Maly
Masiello
Zhang

Associate Professors

Michael
Kaminsky (Research)

Professors

Andersen
Campbell
Chiu
Drobny
Gamelin
Gelb
Ginger
Goldberg
Heinekey
Hopkins
Jenekhe
Keller
Kovacs
Mayer
Rathod
Reid
Reinhardt
Robinson
Sasaki
Synovec
Turecek
Varani
Burgess (Research)

Summary of Selected Professional Activities

Name: AJ Boydston — Date of Revised Vitae: 6/2011
Rank: Assistant Professor — Date of Ph.D.: 2007 — Date of UW hire: 2010 — Date of last promotion: N/A

I. Courses Taught (course number & times taught):

CHEM 237 (1)
CHEM 531 (1)

II. Department and University Service:

Departmental Committees:
Graduate Admissions (by own request) (2010-present)
Graduate Recruiting (2010-present)

College and University Committees:
Undergraduate research symposium moderator (2011)

5 Total Other Graduate Supervisory Committees: (does not include students in own group)

III. Research Group (current):

4	graduate students	1	Postdoctoral associates	0	Ph.D.s granted (career total)
4	undergraduate students	0	other Visiting Faculty		

IV. Invited Lectures: career total 3

2011
Willamette University (set for September 19, 2011)
University of Washington, Dept. of Materials Science and Engineering (February)
University of Washington "Research Exposed" undergraduate seminar (January)

2010
Pacific Lutheran University (November)
ACS Regional Meeting, New Orleans, LA (December)

V. Publications: career total 22 — in press 1 — submitted — book chapters, reviews 3

Peer-Reviewed Journal Articles:

23. Xia, Y.; **Boydston, A. J.**; Grubbs, R. H. "Synthesis and Direct Imaging of Ultrahigh Molecular Weight Cyclic Brush Polymers" *Angew. Chem. Int. Ed.* **2011**, *50*, in press (DOI: 10.1002/anie.201101860).

22. **Boydston, A. J.**; Holcombe, T. W.; Unruh, D. A.; Fréchet, J. M. J.; Grubbs, R. H. "A Direct Route to Cyclic Organic Nanostructures via Ring-Expansion Metathesis Polymerization of a Dendronized Macromonomer" *J. Am. Chem. Soc.* **2009**, *131*, 5388-5389.
    - Highlighted by *C&E News* **2009**, *April 14*, 32.
    - Highlighted by *Nature Chemistry* **2009**, *1*, 178-179.

21. Xia, Y.; **Boydston, A. J.**; Yao, Y.; Kornfield, J. A.; Gorodetskaya, I. A.; Spiess, H. W.; Grubbs, R. H. "Ring-Expansion Metathesis Polymerization: Catalyst Dependent Polymerization Profiles" *J. Am. Chem. Soc.* **2009**, *131*, 2670-2677.

20. **Boydston, A. J.**; Xia, Y.; Kornfield, J. A.; Gorodetskaya, I. A.; Grubbs, R. H. "Cyclic Ruthenium-Alkylidene Catalysts for Ring-Expansion Metathesis Polymerization" *J. Am. Chem. Soc.* **2008**, *130*, 12775-12782.

19. Tang, T.; Coady, D. J.; **Boydston, A. J.**; Dykhno, O. L.; Bielawski, C. W. "Pro-Ionomers: An Anion Metathesis Approach to Amphiphilic Block Ionomers from Neutral Precursors" *Adv. Mater.* **2008**, *20*, 3096-3099.

18. **Boydston, A. J.**; Vu, P. D.; Dykhno, O. L.; Chang, V.; Wyatt, A. R., II; Stockett, A. S.; Ritschdorff, E. T.; Shear, J. B.; Bielawski, C. W. "Modular Fluorescent Benzobis(imidazolium) Salts: Syntheses, Photophysical Analyses, and Applications" *J. Am. Chem. Soc.* **2008**, *130*, 3143-3156.

17. **Boydston, A. J.**; Pecinovsky, C. S.; Chao, S. T.; Bielawski, C. W. "Phase-Tunable Fluorophores Based Upon Benzobis(imidazolium) Salts" *J. Am. Chem. Soc.* **2007**, *129*, 14550-14551.

16. Vu, P. D.; **Boydston, A. J.**; Bielawski, C. W. "Ionic Liquids via Efficient, Solvent-Free Anion Metathesis" *Green Chem.* **2007**, *9*, 1158-1159.

15. Williams, K. A.; **Boydston, A. J.**; Bielawski, C. W. "Towards Electrically Conductive, Self-Healing Materials" *J. R. Soc. Interface* **2007**, 4, 359-362.

14. **Boydston, A. J.**; Rice, J. D.; Sanderson, M. D.; Dykhno, O. L.; Bielawski, C. W. "Mild and Efficient Syntheses of Main-Chain Organometallic Polymers Containing Bis(bidentate) Benzobis(imidazolylidene)s and a Related Bis(benzimidazolylidene)Ni(II) Complex" *Organometallics* **2006**, *25*, 6087-6098.

13. Khramov, D. M.; **Boydston, A. J.**; Bielawski, C. W. "Synthesis and Study of Janus Bis(carbene)s and Their Transition Metal Complexes" *Angew. Chem., Int Ed.* **2006**, *45*, 6186-6189.

12. **Boydston, A. J.**; Khramov, D. M.; Bielawski, C. W. "An Alternative Synthesis of Benzobis(imidazolium) Salts Via a "One-pot" Cyclization/Oxidation Reaction Sequence" *Tetrahedron Lett.* **2006**, *47*, 5123-5125.

11. Khramov, D. M.; **Boydston, A. J.**; Bielawski, C. W. "Highly Efficient Synthesis and Solid-State Characterization of 1,2,4,5-Tetrakis(alkyl– and arylamino)benzenes and Cyclization to Their Respective Benzobis(imidazolium) Salts" *Org. Lett.* **2006**, *8*, 1831-1834.

10. Sartin, M. M.; **Boydston, A. J.**; Pagenkopf, B. L.; Bard, A. J. "Electrochemistry, Spectroscopy, and Electrogenerated Chemiluminescence of Silole-Based Chromophores" *J. Am. Chem. Soc.* **2006**, *128*, 10163-10170.
    - Highlighted by the ACS: *Chemical Innovation Heart Cut*: August 28, **2006**.

9. Hinrichs, H.; **Boydston, A. J.**; Jones, P. G.; Hess, K.; Herges, R.; Haley, M. M.; Hopf, H. "The Phane Properties of [2.2]Paracyclophane/ Dehydrobenzoannulene Hybrids" *Chem. Eur. J.* **2006**, *12*, 7103-7115.

8. **Boydston, A. J.**; Williams, K. A.; Bielawski, C. W. "A Modular Approach to Main-Chain Organometallic Polymers" *J. Am. Chem. Soc.* **2005**, *127*, 12496-12497.
    - Highlighted by *C&E News* **2005**, *Sept. 5*, 32.

7. **Boydston, A. J.**; Pagenkopf, B. L. "Improving Quantum Efficiencies of Siloles and Silole-derived Butadiene Chromophores through Structural Tuning" *Angew. Chem., Int. Ed.* **2004**, *43*, 6336-6338.
    - Highlighted by the ACS: *Chemical Innovation Heart Cut*: December 13, **2004**.

6. **Boydston, A. J.**; Yin, Y.; Pagenkopf, B. L. "A Controlled, Iterative Synthesis of Oligo[(p-phenyleneethynylene)-alt-(2,5-siloleneethynylene)]s" *J. Am. Chem. Soc.* **2004**, *126*, 10350-10354.

5. **Boydston, A. J.**; Yin, Y.; Pagenkopf, B. L. "Synthesis and Electronic Properties of Donor-Acceptor π-Conjugated Siloles" *J. Am. Chem. Soc.* **2004**, *126*, 3724-3725.
    - Highlighted by the ACS: *Chemical Innovation Heart Cut*: April 19, **2004**.

4. **Boydston, A. J.**; Haley, M. M.; Williams, R. V.; Armantrout, J. R. "Diatropicity of 3,4,7,8,9,10,13,14-Octadehydro[14]annulenes: A Combined Experimental and Theoretical Investigation" *J. Org. Chem.* **2002**, *67*, 8812-8819.

3. **Boydston, A. J.**; Laskoski, M.; Bunz, U. H. F.; Haley, M. M. "Evaluation of Ring-Strain Effects in Cycloalkene-Fused Octadehydro[14]annulenes" *Synlett* **2002**, 981-983.

2. **Boydston, A. J.**; Haley, M. M. "Diatropicity of Dehydrobenzo[14]annulenes: Comparative Analysis of the Bond-Fixing Ability of Benzene on the Parent 3,4,7,8,9,10,13,14-Octadehydro[14]annulene" *Org. Lett.* **2001**, *3*, 3599-3601.

1. **Boydston, A. J.**; Bondarenko, L.; Dix, I.; Weakley, T. J. R.; Hopf, H.; Haley, M. M. "[2.2]Paracyclophane/Dehydrobenzoannulene Hybrids: Transannular Delocalization in Open-Circuited Conjugated Macrocycles" *Angew. Chem., Int. Ed.* **2001**, *40*, 2986-2989.

Book Chapters and Review Articles:

3. Williams, K. A.; **Boydston, A. J.**; Bielawski, C. W. "Main-Chain Organometallic Polymers: Synthetic Strategies, Applications, and Perspectives" *Chem. Soc. Rev.* **2007**, *36*, 729.

2. **Boydston, A. J.** and Bielawski, C. W. "Bis(imidazolylidene)s as Modular Building Blocks for Monomeric and Macromolecular Organometallic Materials" *Dalton Trans.* **2006**, 4073-4077 (Journal Cover).

1. **Boydston, A. J.** and Bielawski, C. W. "Synthetic Versatility and Structural Modularity in Organometallic Polymers." In: Metal-Containing Polymers, Abd-El-Aziz, A.; Pittman, C., Eds.; Springer: New York, 2008, pp. 1- 20.

VI. Grant Activity:

Current

Agency: American Chemical Society, Petroleum Research Fund 07/2011–08/2013 $100,000
Title: Organocatalyzed Electroorganic Synthesis
Role: PI

Agency: Royalty Research Fund 09/2011–08/2012 $39,983
Title: Development of Mechanochemical Triggers for Self-Immolative Polymers
Role: PI

Agency: Army Research Office, Young Investigator Program 08/2011–07/2014 $150,000
Title: Mechanochemical Activation of Small Ring Cyclopolymers
Role: PI

Previous:

Agency: Washington Technology Center 07/2010–12/2010 $41,686
Title: Aerodynamic and Chemical Improvements to Enhance Mosquito Trapping
Role: Co-PI. Total award amount: $79,974

Future:

Agency: National Science Foundation TBD TBD
Title: CAREER: New Reactivities and Opportunities Through Polymer Mechanochemistry
Role: PI

Others Applied

Agency: Air Force Office of Scientific Research, Young Investigator Program $355,044
(applied, agency portfolio was dissolved during review cycle)
Title: Electro-organocatalysis: Interfacing Electroorganic Synthesis and Organocatalysis
Role: PI

VII. Honors and Awards:

National Institutes of Health (NCI) National Research Service Award (2008-2010)
International Precious Metals Institute Student Award (2006)
University of Texas Professional Development Award (2006)
George Kozmetsky Award for Outstanding Graduate Research in Nanotechnology (finalist, 2006)
University of Texas Continuing Graduate Fellowship (2005-2006)
Welch Summer Research Fellowship (2004)
University of Texas Teaching Assistant Award (2003)
National Science Foundation Graduate Fellowship (honorable mention, 2003)
University of Texas Teaching Assistant Award (2002)
University of Texas pre-emptive recruitment fellowship (2002-2003)
Organic Chemistry Achievement Award (2001)

VIII. Additional Comments on Research, Teaching, and Service:

Reviewer:
Air Force Office of Scientific Research (AFOSR)
Army Research Office (ARO)
Kentucky Science and Engineering Foundation (KSEF)
Royalty Research Fund (RRF)

Referee:
Journal of the American Chemical Society
Macromolecules

Community:
Presenter at Wedgwood Elementary Science Night 2011

Patents:
3. "Photo- and Thermally-Isomerizable UV-Vis Absorbers for On-Demand Photoinitiated Polymerization." Andrew J. Boydston and Robert H. Grubbs, Provisional U.S. Patent Application Filed on July 6, 2009.
2. "Cyclic Macromolecules as Additives for Lubricants." Andrew J. Boydston and Robert H. Grubbs, Provisional U.S. Patent Application Filed on September 12, 2008.
1. "A Method for Anion Metathesis and Compositions Related Thereto." Christopher W. Bielawski and Andrew J. Boydston, Provisional U.S. Patent Application Filed on February 20, 2007.

Summary of Selected Professional Activities

Name: **Champak Chatterjee** Date of Revised Vitae: **6/2011**
Rank: **Assistant Professor** Date of Ph.D.: **2005** Date of UW hire: **2010** Date of last promotion: **N/A**

I. Courses Taught (all, number of times):
Chem 239A (1), Chem 532 (1)
Evaluations (adjusted median, all items): 4.0 (Chem 239A)

II. Department and University Service (2010 - present):
Departmental Committees:
Graduate Admissions Committee (2010-present)
Graduate Applications and Recruiting (2010-present)

College and University Committees: none

7 Other Graduate Supervisory Committees: (does not include students in own group)

III. Research Group (current):

1 graduate student
6 undergraduate students
0 Postdoctoral associates
0 other Visiting Faculty
0 Ph.D.s granted since 2010

IV. Invited Lectures (2010 - present): 1

January 2012 Department of Biochemistry, Biophysics & Molecular Biology, Iowa State University

V. Publications (2006 - present): 13 in press 0 submitted 1 book chapters, reviews 0

Prior to the University of Washington (2006-10):

1. Miller, L. M.; **Chatterjee, C**.; van der Donk, W. A.; Kelleher, N. L. The dehydratase activity of Lacticin 481 synthetase is highly processive *J. Am. Chem. Soc.* **2006,** *128*, 1420-121.
2. **Chatterjee, C.**[*]; Patton, G. C.[*]; Cooper, L.; Paul, M.; van der Donk, W. A. Engineering dehydro amino acids and thioethers into peptides using Lacticin 481 synthetase *Chem. Biol.* **2006,** *13*, 1109-1117.
3. **Chatterjee, C.**; McGinty, R. K.; Pellois, J.-P.; Muir, T. W. Auxiliary-mediated site-specific peptide ubiquitylation *Angew. Chem. Int. Ed. Engl.* **2007,** *46*, 2814-2818.
4. McGinty, R. K.; Kim, J.; **Chatterjee, C.**; Roeder, R. G.; Muir, T. W. Chemically ubiquitylated histone H2B stimulates hDot1L-mediated intranucleosomal methylation *Nature* **2008,** *453*, 812-816.
5. Miller, L. M.; Menthena, A.: **Chatterjee, C.**; Verdier-Pinard, P.; Novikoff, P. Horwitz, S. B.; Angeletti, R. H. Increased levels of a unique post-translationally modified βIVb-tubulin isotype in liver cancer *Biochemistry* **2008,** *47*, 7572-7582.
6. Furgerson Ihnken, L. A.; **Chatterjee, C.**; van der Donk, W. A. In vitro reconstitution and substrate specificity of a lantibiotic protease *Biochemistry* **2008,** *47*, 7352-7363.
7. Patton, G. C.; Paul, M.; Cooper, L. E.; **Chatterjee, C.**; van der Donk, W. A. The importance of the leader sequence for directing lanthionine formation in lacticin 481 *Biochemistry* **2008,** *47*, 7342-7351.
8. Levengood, M. R.; Kerwood, C. C.; **Chatterjee, C.**; van der Donk, W. A. Investigations of the substrate specificity of lacticin 481 synthetase by using nonproteinogenic amino acids *ChemBioChem* **2009,** *10*, 911-919

9. McGinty, R. K.; Kohn, M.; **Chatterjee, C.**; Chiang, K. P; Pratt, M. R.; Muir, T. W. Structure activity analysis of semisynthetic nucleosomes: Mechanistic insights of the stimulation of Dot1L by ubiquitylated histone H2B *ACS Chem. Biol.* **2009**, *4*, 258-268.
10. McGinty, R. K.; **Chatterjee, C.**; Muir, T. W. Semisynthesis of ubiquitylated proteins *Methods Enzymol.* **2009,** *462*, 225-243.
11. **Chatterjee, C.**; McGinty, R. K.; Fierz, B.; Muir, T. W. Disulfide-directed histone ubiquitylation reveals plasticity in hDot1L activation *Nat. Chem. Biol.* **2010,** *6*, 267-269.
12. **Chatterjee, C.**; Muir, T. W. Chemical approaches for studying histone modifications *J. Biol. Chem.* **2010,** *285*, 11045-11050.

Publications while at the University of Washington (2011):

1. Fierz, B.; **Chatterjee, C.**; McGinty, R. K; Bar-Dagan, M.; Raleigh, D. P.; Muir, T. W. Histone H2B ubiquitylation disrupts local and higher order chromatin compaction *Nat. Chem. Biol.* **2011,** *7*, 113-119.
2. Dhall, A.; **Chatterjee, C.** Chemical approaches to understand the language of histone modifications (*submitted to ACS Chemical Biology)* May 2011.

VI. Grant Activity (2010 - present):

Applied for the following

2010 Pew Biomedical Scholars Program (UW internal review)
2010 Searle Scholar Award (UW internal review)
2010 Royalty Research Fund: Chemical tools to interrogate histone SUMOylation
2011 Kimmel Scholar Award

In preparation

2011 NSF CAREER: Chemical approaches to investigate the Pup-proteasomal pathway in mycobacteria
2011 Royalty Research Fund: Activity-based probes for mycobacterial enzymes

---

VII. Honors and Awards:

None

VIII. Additional Comments on Research, Teaching, and Service:

1. Faculty member of the interdisciplinary program in biomolecular structure and design (BMSD) at UW.
2. Contributed toward NSF-IGERT application for Molecular Engineering and Science (Lead PI: Rene Overney).
3. Guest lecturer for protein engineering in Chem E 599, Molecular Engineering and Science, Fall 2011.
4. Contributed toward NIH Shared Instrumentation Grant application (Lead PI: Frank Turecek).
5. Preparing application for a training program at the Chemistry–Biology interface, NIH Institutional National Research Service Award (NRSA), that will be submitted January 2012 (Lead PI: Michael Gelb).

Summary of Selected Professional Activities

Name: Munira Khalil — Date of Revised Vitae: 6/2011
Rank: Assistant Professor — Date of Ph.D.: 2004 — Date of UW hire: 2007 — Date of last promotion: N/A

I. Courses Taught (only list course number & times taught, e.g. "CHEM 142 (12)"):

Chem 452 (4)
Chem 551 (3)
Chem 399 (5)
Chem 499 (4)
Chem 600 (13)
Chem 595 (3)
Chem 581 (2)

II. Department and University Service:

Departmental Committees

Physical Chemistry Second-Year Graduate Exam Committee, 2010
Physical Chemistry First-Year Graduate Advisor, 2010-present
Graduate Student Recruitment Committee, 2007-present
Graduate Student Admissions Committee, 2010-present

College and University Committees:

Discovery 2y2d Focus Group (2009-10)

[10] Total Other Graduate Supervisory Committees: (does not include students in own group)

III. Research Group (current):

[7] graduate students — [ ] Postdoctoral associates — [ ] Ph.D.s granted (career total)
[1] undergraduate students — [ ] other Visiting Faculty

IV. Invited Lectures: career total [36]

Selected talks:

1. Physical Chemistry Seminar, Harvard University, Department of Chemistry, 10-26-05.
2. Advanced Light Source Users' Meeting, Workshop on "Ultrafast X-ray Science at the ALS," 10-22-05.
3. 33rd Annual SSRL Users' Meeting & Workshops, Workshop on "Ultrafast Dynamics on Surfaces and in Liquids," SLAC, 10-11-06
4. Gordon Research Conference on Ultrafast Phenomena in Cooperative Systems, 2-7-06.
5. Physical Chemistry Seminar, University of Southern California, Department of Chemistry, 2-5-07.
6. American Chemical Society Mtg, Symp. on Optical Probes of Dynamics in Complex Environments, 04-07-08.
7. Physical Chemistry Seminar, University of Oregon, Department of Chemistry, 5-12-08.
8. Chemistry Seminar, Idaho State University, Department of Chemistry, 9-12-08.
9. Condensed Matter/AMO Seminar, University of Washington, Department of Physics, 06-02-09.
10. UW CNT Conference on Nanotechnology & UW/NIMS Forum, University of Washington, 06-10-09.
11. ACS Meeting, Symposium on Chemical Reaction Dynamics in Gaseous and Condensed Phases, 08-19-09.
12. OSA Laser Science XXV meeting, Symposium on Ultrafast X-ray Science, 10-13-09.
13. DOE 2009 Contractors' Meeting on Condensed Phase and Interfacial Molecular Science, 10-19-2009.
14. "The Future of Ultrafast Soft X-ray Science," Ultrafast X-ray Science Laboratory, LBNL, 12-02-2009
15. 2010 Gordon Conference on Radiation Chemistry, 07-2010, *declined due to maternity*.
16. 5th International Conference on Coherent Multidimensional Spectroscopy, 08-2010.
17. 2nd International Conference on Transient Chemical Structure in Dense Media, Paris, 11-2010, *declined due to maternity.*

18. American Chemical Society Mtg, Symp. on Infrared Spectroscopy of Gas and Condensed Phase Biomolecules, 04-28-11.
19. Physical Chemistry Seminar, University of Oregon, Department of Chemistry, May 23, 2011.

V. Publications: career total [32] in press [ ] submitted [1] book chapters, reviews [ ]

Selected Publications:

1. *Cheng M and Khalil, M "Structural Fluctuations in the Acitve Site of Nitrophorins." Journal of the American Chemical Society, 2011 (in preparation).
2. *Lynch, M.S., Van Kuiken, B.E., Daifuku, S. and Khalil, M. "Role of High Frequency Vibrations During Femtosecond Electron Transfer in a Transition Metal Mixed Valence Complex." Journal of Physical Chemistry Letters, 2011 (in preparation).
3. *Cheng, M., Reynolds, A and Khalil, M. "Development of a Novel Tunable Broadband Mid-Infrared Pulsed Source for Nonlinear Femtosecond Infrared Spectroscopies." Optics Letters, 2011 (in preparation).
4. *Van Kuiken, B.E., and Khalil, M. "Ab inito Simulation of Iron K-edge Picosecond X-ray Absorption Spectroscopy Detailing Electronic Structural Changes During Spin Crossover in Fe(II) Complexes" Journal of Physical Chemistry A, 2011 (submitted).
5. *Lynch, M.S., Cheng, M., Van Kuiken, B.E., and Khalil, M. "Probing the Photoinduced Metal–Nitrosyl Linkage Isomerism of Sodium Nitroprusside in Solution Using Transient Infrared Spectroscopy." Journal of the American Chemical Society, 2011, 133(14):5255.
6. *Lynch, M.S., Cheng, M., Van Kuiken, B.E., Daifuku, S. and Khalil, M. "Uncovering Coherent and Incoherent Vibrational Interactions in a Transition Metal Mixed Valence Complex Using Femtosecond Two-Dimensional Infrared Spectroscopy." In Ultrafast Phenomena XVII, Oxford University Press, 2011, 346.
7. *Huse, N., Kim, T.K., Khalil, M., Jamula, L., McCusker, J.K., and Schoenlein, R.W. "Probing Reaction Dynamics of Transition-Metal Complexes in Solution via Time-Resolved Soft X-ray Spectroscopy." Springer Series in Chemical Physics, 2009, 92: 125.
8. *Huse, N., Khalil, M., Kim, T.K., Smeigh, A.L., Jamula, L., McCusker, J.K., and Schoenlein, R.W. "Probing Reaction Dynamics Of Transition-Metal Complexes In Solution Via Time-Resolved X-Ray Spectroscopy." Journal of Physics: Conference Series, 2009, 148.
9. Loh, Z.-H., Khalil, M., Correa, R.E., and Leone, S.R. "A tabletop femtosecond time-resolved soft x-ray transient absorption spectrometer." Review of Scientific Instruments, 2008, 79(7): 073101.
10. Loh, Z.-H., Khalil, M., Correa, R.E., Santra, R., Buth, C., and Leone, S.R. "Quantum State-Resolved Probing of Strong-Field-Ionized Xenon Atoms Using Femtosecond High-Order Harmonic Transient Absorption Spectroscopy." Physical Review Letters, 2007, 98(14): 143601.
11. Chung, H.S., Khalil, M., Smith, A.W., and Tokmakoff, A. "Transient two-dimensional IR spectrometer for probing nanosecond temperature-jump kinetics." Review of Scientific Instruments, 2007, 78(6): 063101.
12. Khalil, M., Marcus, M.A., Smeigh, A.L., McCusker, J.K., Chong, H.H.W., and Schoenlein, R.W. "Picosecond X-ray Absorption Spectroscopy of a Photoinduced Iron(II) Spin Crossover Reaction in Solution." Journal of Physical Chemistry A, 2006, 110(1): 38.
13. Chung, H.S., Khalil, M., Smith, A.W., Ganim, Z., and Tokmakoff, A. "Conformational changes during the nanosecond-to-millisecond unfolding of ubiquitin." Proceedings of the National Academy Of Sciences Of The United States Of America, 2005, 102(3): 612.
14. Khalil, M., Demirdöven, N., and Tokmakoff, A. "Vibrational coherence transfer characterized with Fourier-transform 2D IR spectroscopy." Journal of Chemical Physics, 2004, 121(1): 362.
15. Demirdöven, N., Cheatum, C.M., Chung, H.S., Khalil, M., Knoester, J., and Tokmakoff, A. "Two-dimensional infrared spectroscopy of antiparallel beta-sheet secondary structure." Journal of the American Chemical Society, 2004, 126(25): 7981.
16. Chung, H.S., Khalil, M., and Tokmakoff, A. "Nonlinear infrared spectroscopy of protein conformational change during thermal unfolding." Journal of Physical Chemistry B, 2004, 108(39):15332.
17. Khalil, M., Demirdöven, N., and Tokmakoff, A. "Obtaining absorptive line shapes in two-dimensional infrared vibrational correlation spectra." Physical Review Letters, 2003, 90(4).

18. Khalil, M., Demirdöven, N., and Tokmakoff, A. "Coherent 2D IR spectroscopy: Molecular structure and dynamics in solution." Journal of Physical Chemistry A, 2003, 107(27): 5258.
19. Demirdöven, N., Khalil, M., and Tokmakoff, A. "Correlated vibrational dynamics revealed by two-dimensional infrared spectroscopy." Physical Review Letters, 2002, 89(23).
20. Demirdöven, N., Khalil, M., Golonzka, O., and Tokmakoff, A. "Dispersion compensation with optical materials for compression of intense sub-100-fs mid-infrared pulses." Optics Letters, 2002, 27(6): 433.
21. Khalil, M. and Tokmakoff, A. "Signatures of vibrational interactions in coherent two-dimensional infrared spectroscopy." Chemical Physics, 2001, 266(2-3): 213.
22. Golonzka, O., Khalil, M., Demirdöven, N., and Tokmakoff, A. "Vibrational anharmonicities revealed by coherent two-dimensional infrared spectroscopy." Physical Review Letters, 2001. 86(10): 2154.
23. Golonzka, O., Khalil, M., Demirdöven, N., and Tokmakoff, A. "Coupling and orientation between anharmonic vibrations characterized with two-dimensional infrared vibrational echo spectroscopy." Journal of Chemical Physics, 2001, 115(23): 10814.
24. Demirdöven, N., Khalil, M., Golonzka, O., and Tokmakoff, A., "Correlation effects in the two-dimensional vibrational spectroscopy of coupled vibrations." Journal of Physical Chemistry A, 2001, 105(34): 8025.
25. Khalil, M., Golonzka, O., Demirdöven, N., Fecko, C.J., and Tokmakoff, A. "Polarization-selective femtosecond Raman spectroscopy of isotropic and anisotropic vibrational dynamics in liquids". Chemical Physics Letters, 2000, 321(3-4): 231.
26. Khalil, M., Demirdöven, N., Golonzka, O., Fecko, C.J., and Tokmakoff, A. "A phase-sensitive detection method using diffractive optics for polarization-selective femtosecond Raman spectroscopy." Journal of Physical Chemistry A, 2000, 104(24): 5711.
27. Golonzka, O., Demirdöven, N., Khalil, M., and Tokmakoff, A. "Separation of cascaded and direct fifth-order Raman signals using phase-sensitive intrinsic heterodyne detection." Journal of Chemical Physics, 2000, 113(22): 9893.
28. Khalil, M. and Shen, Q. "Molecular Structure and Conformational Composition of 3,4-Epoxy-1-butene As Determined by ab Initio Molecular Orbital Calculations, Microwave Spectroscopy, and Gas-Phase Electron Diffraction." Journal of Physical Chemistry A, 1999, 103(28): 5585.
29. Uberna, R., Khalil, M., Williams, R.M., Papanikolas, J.M., and Leone, S.R. "Phase and amplitude control in the formation and detection of rotational wave packets in the E 1Sigma g+ state of Li2." Journal of Chemical Physics, 1998, 108(22): 9259.

I. Grant Activity:

Current

DOE-SISGR (PI)	09/09-09/12	$860,000
NSF-CAREER (PI)	08/09-08/14	$658,460
David and Lucille Packard Fellowship in Science and Engineering (PI)	09/08-09/13	$875,000
Camille and Henry Dreyfus New Faculty Award (PI)	09/07-09/12	$50,000

VII. Honors and Awards:

2009	NSF CAREER Award
2008	David and Lucille Packard Fellowship in Science & Engineering
2007	Camille and Henry Dreyfus New Faculty Award
2004	Miller Research Fellowship
2002	Lester Wolfe Graduate Fellowship, MIT
1999	Outstanding Teaching Assistant Award, MIT
1997	Phi Beta Kappa

VIII. Additional Comments on Research, Teaching, and Service:

Summary of Selected Professional Activities

Name: Gojko Lalic — Date of Revised Vitae: 6/2011
Rank: Assistant Professor — Date of Ph.D.: 2004 — Date of UW hire: 2008 — Date of last promotion: N/A

I. Courses Taught (only list course number & times taught, e.g. "CHEM 142 (12)"):

CHEM 530A (3)
CHEM 337HA (3)

II. Department and University Service:

Department Committees:

Organic Faculty Search Committee (2008-11)
Sophomore Organic Task Force (2008-11)
Graduate Recruiting (2008-11)
Chemistry Department Safety Committee (2010-11)

College and University Committees:

none

[15] Total Other Graduate Supervisory Committees: (does not include students in own group)

III. Research Group (current):

[5]	graduate students	[0]	Postdoctoral associates	[0]	Ph.D.s granted (career total)
[ ]	undergraduate students	[0]	other Visiting Faculty		

IV. Invited Lectures: career total [1]

Western Washington University, April 15th, 2011

V. Publications: career total [16] in press [ ] submitted [ ] book chapters, reviews [ ]

1. Rucker, R. P.; Whittaker, A. M. Lalic, G. "Copper-Catalyzed Amination of Alkyl Boranes: Anti-Markovnikov Hydroamination of Terminal Alkenes" *Angew. Chem. In. Ed.* Submitted.

2. Whittaker, A. M.; Rucker, R. P.; Lalic, G. "Catalytic S_N2'-Selective Substitution of Allylic Chlorides With Arylboronic Esters." *Org. Lett.* **2010**, *12*, 3216.

3. Lalic G.; Corey E. J. "Enantioselective rhodium(I)-triethylamine catalyzed addition of potassium isopropenyltrifluoroborate to enones." *Tetrahedron Letters* **2008**, *49*, 4894.

4. Lalic G.; Krinsky J. L.; Bergman R. G. "The Scope and the Mechanism of S_N2' Substitution Reactions of a Monomeric Imidozirconium Complex With Allylic Electrophiles." *J. Am. Chem. Soc.* **2008**, *130*, 4459.

5. Lalic G.; Corey E. J. "An Effective Enantioselective Route to the Platensimycin Core." *Org. Lett.* **2007**, *9*, 4921.

6. Fox R. J.; Lalic G.; Bergman R. G. "Regio- and Stereospecific Formation of Protected Allylic Alcohols via Zirconium-Mediated S_N2' Substitution of Allylic Chlorides." *J. Am. Chem. Soc.* **2007**, *129*, 14144.

7. Lalic G.; Blum S. A.; Bergman R. G. "Zirconium-Mediated S_N2' Substitution of Allylic Ethers: Regio- and Stereospecific Formation of Protected Allylic Amines." *J. Am. Chem. Soc.* **2005**, *127*, 16790.

8. Magdziak D.; Lalic G.; Myung Lee H.; Fortner K. C.; Aloise, A. D.; Shair M. D. "Catalytic Enantioselective Thioester Aldol Reactions That are Compatible With Protic Functional Groups." *J. Am. Chem. Soc.* **2005**, *127*, 7284.

9. Xu K.; Lalic G.; Sheehan S. M.; Shair M. D. "Dynamic Kinetic Resolution during a Cascade Reaction on Substrates with Chiral All-Carbon Quaternary Centers." *Angew. Chem. Int. Ed.* **2005**, *44*, 2259.

10. Lalic G.; Aloise A. D.; Shair M. D. "An Exceptionally Mild Thioester Aldol Reaction Inspired by Polyketide Biosynthesis." *J. Am. Chem. Soc.* **2003**, *125*, 2852.

11. Burke M. D.; Lalic G. "Teaching Target-Oriented and Diversity-Oriented Organic Synthesis at Harvard University." *Chem. Biol.* **2002**, 9, 535.

12. Korbel G. A.; Lalic G.; Shair M. D. "Reaction Microarrays: A Method for Rapidly Determining the Enantiomeric Excess of Thousands of Samples." *J. Am. Chem. Soc.* **2001**, *123*, 361.

13. Lalic G.; Petrovski Z.; Galonic D.; Matovic R.; Saicic R. N. "Alkylation of Carbonyl Compounds in the $TiCl_4$-promoted Reaction of Trimethylsilyl Enol Ethers with Epoxides." *Tetrahedron* **2001**, *57*, 583.

14. Sheehan S. M.; Lalic G.; Chen J. S.; Shair M. D. "A Highly Efficient and Convergent Reaction for the Synthesis of Bridgehead Enone-Containing Polycyclic Ring Systems." *Angew. Chem. Int. Ed.* **2000**, *39*, 2714.

15. Lalic G.; Petrovski Z.; Galonic D.; Matovic R.; Saicic R. N. "Alkylation of Carbonyl Compounds in the $TiCl_4$-promoted Reaction of Trimethylsilyl Enol Ethers with Ethylene Oxide." *Tetrahedron Lett.* **2000**, *41*, 763.

16. Barton D. H. R.; Lalic G.; Smith J. A. "The Selective Functionalization of Saturated Hydrocarbons. Part 42. Further Studies in Selective Phenylselenation." *Tetrahedron* **1998**, *54*, 1725.

VI. Grant Activity:

pending
NIH RO1

VII. Honors and Awards:

VIII. Additional Comments on Research, Teaching, and Service:

Summary of Selected Professional Activities

Name: Xiaosong Li Date of Revised Vitae: 6/2011
Rank: Assistant Professor Date of Ph.D.: 2003 Date of UW hire: 2005 Date of last promotion: N/A

I. Courses Taught (only list course number & times taught, e.g. "CHEM 142 (12)"):

CHEM 455 (6)
CHEM 465 (6)

II. Department and University Service:

Departmental Committees:

Graduate Recruiting Committee (2005-present)
Graduate Admission Committee (2006-present)

College and University Committees:

none

8 Total Other Graduate Supervisory Committees: (does not include students in own group)

III. Research Group (current):

6 graduate students
4 undergraduate students
3 Postdoctoral associates
other Visiting Faculty
2 Ph.D.s granted (career total)

IV. Invited Lectures: career total 42

2006
The Second International Conference on Theoretical Chemistry, Molecular Modeling and Life Sciences, NanDaiHe, China, July

2007
Workshop on High Performance Computing, Beijing, China, April

2008
Department of Applied Mathematics, University of Washington, Seattle, WA, February
Connecticut Quantum Chemistry Meeting, Wallingford, CT, February
Korean Advanced Institute of Science & Technology (KAIST), Daejoon, Korea, February
Transatlantic Frontiers in Chemistry Symposium, Chester, UK, August
Keynote Lecture, Graduate Symposium, Wayne State Univ., Detroit, MI, October

2009
237th National Meeting of the American Chemical Society, Salt Lake City, UT, March (two talks)
University of New Mexico, Albuquerque, NM, April
University of Wisconsin, Madison, WI, April
Northwestern University, Evanston, IL, April
University of Washington Nanotechnology Symposium, Seattle, WA, June
Conference on Excited State Processes, Santa Fe, NM, July
Telluride Scientific Research Conference, Telluride, CO, July
SPIE National Conference, San Diego, CA, August
Fudan University, Shanghai, China, September
Tsinghua University, Beijing, China, September
Beijing Normal University, Beijing, China, September

2010
Chemical Physics Seminar, California Institute of Technology, Pasadena, CA, April
Theory Seminar, University of California-Berkeley, May
ACS NORM/RMRM Meeting, Pullman, WA, June
Yale University, New Haven, CT, June
SPIE National Conference, San Diego, CA, August
240th National Meeting of the American Chemical Society, Boston, MA, August

University of California, Los Angeles, CA, October

2011
Duke University, Durham, NC, January
University of North Carolina, Chapel Hill, NC, January
University of Oregon, Eugene, OR, February
Ohio State University, Columbus, OH, April
Purdue University, West Lafayette, IN, April
Indiana University, Bloomington, IN, April
Wayne State University, Detroit, MI, April
University of Michigan, Ann Arbor, MI, April
Stanford University, Palo Alto, CA, May
Telluride Scientific Research Conference, Telluride, CO, July
University of Washington, Seattle, WA, September

2012
243th, National Meeting of the American Chemical Society, San Diego, CA March
244th National ACS Meeting, Philadelphia, PA, August

V. Publications: career total 69 in press 0 submitted 3 book chapters, reviews

69. C. L. Moss, W. Liang, X. Li, F. Tureček, "The Early Life of a Peptide Cation-Radical," ***submitted.***
68. F. Ding, W. Liang, C. T. Chapman, X. Li, "On the Gauge Invariance of the Time-dependent Hartree-Fock and Kohn-Sham Electronic Dynamic," ***submitted.***
67. S. A. Fischer, C. T. Chapman, X. Li, "Surface Hopping with Ehrenfest Excited Potential," *submitted*.
66. C. T. Chapman, W. Liang, X. Li, "Ultrafast Coherent Electron-hole Separation Dynamics in a Fullerene Derivative," *J. Phys. Chem. Lett.*, **2011**, 2, 1189.
65. W. Liang, C. T. Chapman, X. Li, "Efficient First-Principles Electronic Dynamics," *J. Chem. Phys.*, **2011**, 134, 184102.
64. D. H. Bale, B. E. Eichinger, W. Liang, X. Li, L. R. Dalton, B. H. Robinson, and P. J. Reid, "Dielectric Dependence of the First Molecular Hyperpolarizability for Electro-Optic Chromophores," *J. Phys. Chem. B,* **2011**, 115, 3505. (*The theoretical part of this work is a collaborative work*)
63. C. T. Chapman, W. Liang, X. Li, "Open-system Electronic Dynamics and Thermalized Electronic Structure," *J. Chem. Phys*., **2011**, 134, 024118.
62. W. Liang, C. T. Chapman, M. J. Frisch, X. Li, "Geometry Optimization with Multilayer Methods Using Least-Squares Minimization," *J. Chem. Theory Comput.*, **2010**, 6, 3352.
61. J. Hung, W. Liang, J. Luo, Z. Shi, A. K.-Y. Jen, X. Li, "Rational Design using Dewar's Rules for Enhancing the First Hyperpolarizability of Nonlinear Optical Chromophores," *J. Phys. Chem. C*, **2010**, 114, 22284.
60. W. Liang, H. Wang, J. Hung, X. Li, M. J. Frisch "Eigenspace Update for Molecular Geometry Optimization in Nonredundant Internal Coordinate," *J. Chem. Theory Comput*., **2010**, 6, 2034.
59. Z. Shi, W. Liang, J. Luo, S. Huang, B. Polishak, X. Li, T. Younkin, B. Block, A. Jen, "Tuning the Kinetics and Energetics of Diels-Alder Cycloaddition Reactions to Improve Poling Efficiency and Thermal Stability of High Temperature Crosslinked Electro-Optic Polymers," *Chem. Mater.*, **2010**, 22, 5601.
58. W. Liang, C. M. Isborn, A Lindsay, X, Li, S. M. Smith, R. J. Levis, "Time-dependent Density Functional Theory Ehrenfest Dynamics Studies of Laser controlled Dissociation of NO^+: Multi-photon Excitation and Laser Pulse Length," *J. Phys. Chem. A*, **2010**, 114, 6201.
57. Y. Feng, E. Badaeva, D. R. Gamelin, and X. Li, "Excited-State Double Exchange in Manganese-Doped ZnO Quantum Dots: A Time-Dependent Density-Functional Study," *J. Phys. Chem. Lett.*, **2010**, 114, 6201.
55. Liang, W.; Isborn, C. M.; Li, X., "Obtaining Hatree-Fock and Density Functional Theory Doubly Excited States with Car-Parrinello Density Matrix Search," *J. Chem. Phys.*, **2009**, 131, 204101.
54. S. T. Ochsenbein, Y. F., K. M. Whitaker, E. Badaeva, W. K. Liu, X. Li, and D. R. Gamelin, "Charge-controlled magnetism in colloidal doped semiconductor nanocrystals," *Nature Nanotechnology*, **2009**, 4, 681.
53. Isborn, C. M., Li, X., "Singlet-triplet Transitions in Real-time Time-dependent Hartree-Fock/Density Functional Theory," *J. Chem. Theory Comput.*, **2009**, 5, 2415.
52. Moss, C. L., Isborn, C. M, Li, X, "Ehrenfest dynamics with time-dependent density functional theory calculation of lifetimes and resonant widths of charge-transfer states of Li^+ near an aluminum cluster surface," *Phys. Rev. A*, **2009**, 80, 024503.

51. Li, X., Moss, C. L., Liang, W., Feng, Y., "Car-Parrinello density matrix search with a first principles fictitious electron mass method for electronic wave function optimization," *J. Chem. Phys*., **2009**, 130, 234115.
50. Liang, W., Isborn, C. M., Li, X., "Laser controlled dissociation of $C_2H_2^{2+}$: Ehrenfest dynamics using time-dependent density functional theory," *J. Phys. Chem. A*, **2009**, 113, 3463.
49. E. Badaeva, C. M. Isborn, Y. Feng, S. T. Ochsenbein, D. R. Gamelin, X. Li, "Theoretical Characterization of Electronic Transitions in Co^{2+}- and Mn^{2+}-Doped ZnO Nanocrystals," *J. Phys. Chem. C*, **2009,** 113, 8710.
48. C. M. Isborn and X. Li, "Modeling the Doubly-Excited State with Time-Dependent Hartree-Fock and Density Functional Theories," *J. Chem. Phys*., **2008**, 129, 204107.
47. C. M. Isborn, S. Kilina, X. Li, and O. Prezhdo, "Calculation of Two Electron Excitations in PbSe and CdSe Quantum Dots," *J. Phys. Chem. C*, **2008**, 112, 18291.
46. C. L. Moss and X. Li, "First Order Simultaneous Optimization of Molecular Geometry and Electronic Wave Function," *J. Chem. Phys.*, **2008**, 129, 114102.
45. Davies, J. A.; Elangovan, A.; Sullivan, P. A.; Olbricht, B. C.; Bale, D. H.; Ewy, E. R.; Isborn, C. M.; Eichinger, B. E.; Robinson, B. H.; Reid, P. J.; Li, X.; Dalton, L. R., "Rational Enhancement of Second-order Nonlinearity: Bis-(4-methoxyphenyl)-*hetero*aryl-amino Donor–Based Chromophores – Design, Synthesis and Electro-optic Activity," *J. Am. Chem. Soc*., **2008**, 130, 10565.
44. Badaeva, E., Feng, Y., Gamelin, D. R., Li, X., "Theoretical Investigations of ZnO Quantum Dots: Comparison of Different Density Functionals," *New J. Phys*, **2008**, 10, 055013.
43. Wustholz, K. L., Bott, E. D., Isborn, C. M., Li, X., Kahr, B., Reid, P. J., "Dispersive Kinetics from Single-Molecules Oriented in Single Crystals of Potassium Acid," *J. Phys. Chem. C*, **2007**, 111:9146.
42. Isborn, C. M., Li, X., and Tully, J. C., "TDDFT Ehrenfest Dynamics: Collisions between Atomic Oxygen and Graphite Clusters," *J. Chem. Phys*., **2007**.126:134307.
41. Li, X. and Tully, J. C., "Ab Initio Time Resolved Density Functional Theory for Lifetimes of Excited Adsorbate States at Metal Surfaces," *Chem. Phys. Lett*., **2007**, 439:199.
40. Smith, S. M., Li, X., Markevitch, A. N., Romanov, D. A., Levis, R. J., and Schlegel, H. B., "A Numerical Simulation of Non-adiabatic Electron Excitation in the Strong-Field Regime: 3. Polyacene Neutrals and Cations," *J. Phys. Chem. A*, **2007**, 111:6920.
39. Schlegel, H. B., Smith, S. M., and Li, X., "Electronic Optical Response of Molecules in Intense Fields: Comparison of TD-HF, TD-CIS and TD-CIS(D) Approaches," *J. Chem. Phys*., **2007**. 126: 244110.
38. Li, X. and Frisch, M. J., "Energy-Represented Direct Inversion in the Iterative Subspace within a Hybrid Geometry Optimization Method," *J. Chem. Theory. Comput*., **2006**, 2: 835.
37. Smith, S. M., Li, X., Markevitch, A. N., Romanov, D. A., Levis, R. J., and Schlegel, H. B., "A Numerical Simulation of Non-Adiabatic Electron Excitation in the Strong Field Regime 2: Linear Polyene Cations," *J. Phys. Chem. A*, **2005**, 109: 10527.
36. Li, X., Tully, J. C., Schlegel, H. B., and Frisch, M. J., "Ab Initio Ehrenfest Dynamics," *J. Chem. Phys*., **2005**.084106.
35. Li, X., Smith, S. M., Markevitch, A. N., Romanov, D. A., Levis, R. J., and Schlegel, H. B., "A Time-Dependent Hartree-Fock Approach for Studying the Electronic Optical Response of Molecules in Intense Fields," *Phys. Chem. Chem. Phys*., **2005**, 7: 233.
34. Smith, S. M., Li, X., Markevitch, A. N., Romanov, D. A., Levis, R. J., and Schlegel, H. B., "A Numerical Simulation of Non-Adiabatic Electron Excitation in the Strong Field Regime: Linear Polyenes," *J. Phys. Chem. A*, **2005**, 109: 5176.

VI. Grant Activity:

Current

National Science Foundation Collaborative Research in Chemistry Program (Co-PI) *Electronically Active Defects in Magnetic ZnO Films and Nanocrystalline Aggregates*	2006-2011	$2,500,000 *(1/3 Li)*
American Chemical Society Petroleum Research Fund – Type G (PI) *Theoretical Studies of Reaction Control with Optical Field*	2007-2009	$40,000
National Science Foundation Cyber-enabled Discover and Innovation (Co-PI) *Beyond Kohn-Sham*	2008-2012	$900,000
National Science Foundation CAREER Award (PI) *Advancing Electronic Structure Theories for Properties and Dynamics of Large Scale Systems: Developments and Applications Integrated with Educational Efforts*	2009-2014	$600,000

Gaussian Inc. Research Fund (PI) *Geometry and Wave Function Optimizations for Large Scale Systems*	2009-2013	$36,000/yr
Sloan Research Fellowship (PI)	2011-2013	$50,000
National Science Foundation Computational Chemistry in the Cloud (PI) *Computational Chemistry in the Cloud*	2011-2013	$110,819
Department of Energy (PI) *Time-dependent Density Functional Theory: Introducing First-Principles Electron Friction in Time-domain*	2011-2014	$270,000

Pending

National Science Foundation – Solar (co-PI) *Rational Optimization of Organic Solar Cell Morphology*	3 years	$360,000
Department of Energy – CMCSN (co-PI) *Charge transfer and transport in photovoltaic systems*	3 years	$360,000
National Institute of Health – Eureka (co-PI) *Re-engineering an intrinsically disordered ubiquitin ligase to target dominant mutant proteins for destruction*	3 years	$1,216,925

Past

University of Washington Royalty Research Fund Award (PI) *Exploring laser control of chemical reactions: development and applications of ab initio Ehrenfest dynamics beyond the perturbative regime*	2006-2007	$3,300
American Chemical Society Petroleum Research Fund – Type G (PI) *Theoretical Studies of Reaction Control with Optical Field*	2007-2009	$4,000

VII. Honors and Awards:

2011 Sloan Research Fellowship, Alfred P. Sloan Foundation
2009 CAREER Award, National Science Foundation
2003 Graduate Dissertation Fellowship, Wayne State University, 2003
2003 Dan Trivich Memorial Award, Wayne State University, 2003
2002 Thomas C. Rumble Fellowship, Wayne State University, 2002

VIII. Additional Comments on Research, Teaching, and Service:

Actively served on Graduate Recruiting and Admission Committees

Average teaching evaluations for all 12 courses I taught in the past four years is 4.8 for the adjusted combined average of items 1-4 of student evaluations

Graduate student Christine Isborn won ACS Women Chemists Committee Travel Award (2006), Alvin L. Kwiram/Council for Chemical Research Graduate Student Fellowship (2006), UIF Fellowship through the UW Center for Nanotechnology (2007), and the IBM-Zerner Graduate Student Fellowship Award (2008)

Graduate student Ekaterina Badaeva won the IBM-Zerner Graduate Student Fellowship Award (2009), Center for Nanotechnology UIF Fellowship (2009 and 2010)

Graduate student Wenkel Liang won ACS Computational Chemistry Award (2011)

Undergraduate student Jane Hung won NASA Research Fellowship (2007, 2008), Mary Gates Scholarship (2008, 2009), Washington State Research Foundation Fellowship (2010), and the Goldwater Fellowship (2011)

Undergraduate student Patricia Tsai won Merck Award (2010).

Undergraduate student Jiao Ma won the PC Cross Award (2011).

Summary of Selected Professional Activities

Name: Dustin Maly — Date of Revised Vitae: **05/13/11**
Rank: **Assistant Professor** Date of Ph.D.: **2002** Date of UW hire: **2006** Date of last promotion: **N/A**

I. Courses Taught (all, number of times):

Chemistry 238 (Winter 2007-2011)
Chemistry 532 (Spring 2007-2010)

II. Department and University Service (2006 - present):

Departmental Committees:
Organic Faculty Search Committee (2006-2007)
Graduate Student Recruitment Committee (2006-present)
Graduate Student Admission Committee (2008-present)

College and University Committees:
none

[>15] Other Graduate Supervisory Committees: (does not include students in own group)

III. Research Group (current):

[10] graduate students
[1] undergraduate students
[1] Postdoctoral associates
[0] other Visiting Faculty
[0] Ph.D.'s granted since 2006

IV. Invited Lectures: [33]

2011:
(02/15/11) Department of Chemistry, University of California, Berkeley, CA
(03/21/11) Department of Biochemistry, University of Wisconsin-Madison
(03/22/11) Chemical Biology Research Symposium, University of Wisconsin, Madison, WI
(03/24/11) Department of Pathology, University of Michigan
(04/10/11) ASBMB National Meeting, Washington DC
(04/13/11) Department of Bioengineering, Northwestern University, Evanston, IL
(04/15/11) Department of Biochemistry, Indiana University
(04/27/11) Department of Chemistry, California Institute of Technology, Pasadena, CA
(05/05/11) Department of Medicinal Chemistry, University of Michigan, Ann Arbor, MI
(05/09/11) Department of Chemistry, Massachusetts Institute of Technology, Cambridge, MA
(05/11/11) Laboratory of Chemical Biology, Rockefeller University, New York, NY
(05/31/11) Department of Pharmacology, SUNY Stony Brook,
(06/02/11) Department of Chemistry, Cornell University, Ithaca, NY
(06/28/11) Dept. of Molec. Pharm. & Chem., Sloan-Kettering Cancer Center, New York, NY
(11/14/11) Department of Chemistry, Colorado State University, Fort Collins, CO

2010:
(01/22/10) Department of Chemistry, Scripps Florida
(03/22/10) American Chemical Society National Meeting – San Francisco, CA
(06/10/10) Gordon Research Conference: GPCRs and Protein Phosphorylation
(06/17/10) Gordon Research Conference: Bioorganic Chemistry
(10/26/10) Department of Chemistry, University of Southern California
(11/16/10) Department of Chemistry and Biochemistry, University of Maryland
(11/18/10) Department of Chemistry, Ohio State University

2009:
(02/25/09) Department of Chemistry, Simon Fraser University, Vancouver, BC
(02/26/09) Department of Chemistry, University of Victoria, Victoria, BC
(03/24/09) ACS National Meeting, Salt Lake City, UT
(06/24/09) Abbott Pharmaceuticals , Chicago, IL
(07/07/09) Enzymes, Coenzymes and Metabolic Pathways Gordon Research Conference
(08/11/09) Exelexis Pharmaceuticals, San Francisco, CA

	(11/11/09)	Department of Pharmacology, Johns Hopkins University, Baltimore, MD
2008:	(06/23/08)	Seattle Biomedical Research Institute, Seattle, WA,
	(12/10/08)	Department of Chemistry, Carroll College, Helena, MT
2007:	(10/10/07)	ACS 41st Western Regional Meeting, San Diego, CA
	(10/26/07)	California State University, Sacramento, Department of Chemistry

V. Publications (2000 - present): 25 in press [ ] submitted 3 book chapters, reviews [ ]

1. Hill, Z. B.; Perera, B. G. K.; Maly, D. J. "Bivalent inhibitors of the tyrosine kinases ABL and SRC: Molecular determinants of potency and selectivity." *Mol. BioSyst.* **2011**, *7*, 447-456. (**DOI**: 10.1039/c0mb00108b)
2. Krishnamurty, R.; Brock, A. M.; Maly, D. J. "5-AminoIndazoles as general affinity reagents for protein kinases" *Bioorg. Med. Chem. Lett.* **2011**, *21*, 550-554. (**DOI**: 10.1016/j.bmcl.2010.10.069)
3. Hari, S. B.; Ranjitkar, P.; Maly, D. J. "Determination of the kinetics and thermodynamics of ligand binding to a specific inactive conformation in protein kinases" *Methods Mol. Biol.* **2011**, (*in press*).
4. Ranjitkar, P.; Maly, D. J. "Affinity purification of protein kinases that adopt a specific inactive conformation" *Methods Mol. Biol.* **2011** (*in press*).
5. Gregersen, K. A. D.; Hill, Z. B.; Gadd, J. C.; Fujimoto, B.; Maly, D. J.; Chiu D. T. "Intracellular Delivery of Bioactive Molecules Using Light-Addressable Nanocapsules" *ACS Nano* **2010**, *4*, 7603-7611. (**DOI**: 10.1021/nn102345f)
6. Ojo,K. K.; Larson, E. T.; Keyloun, K. R.; Castaneda, L. J.; DeRocher, A. E.; Inampudi, K. K.; Kim, J. E.; Arakaki, T.; Murphy, R. C.; Zhang, L.; Napuli, A. J.; Maly, D. J.; Verlinde, C. L. M. J.; Buckner, F. S.; Parsons, M.; Hol, W. G. J.; Merritt, E. A.; Van Voorhis W. C. "Toxoplasma gondii calcium-dependent protein kinase 1 is a target for selective kinase inhibitors." *Nat. Struct. Mol. Biol.* **2010**, *17*, 602-607. (**DOI:** 10.1038/nsmb.1818)2.
7. Murphy, R. C.; Ojo,K. K.; Larson, E. T.; Castellanos-Gonzalez, A.; Perera, B. G. K.; Keyloun, K. R.; Kim, J. E.; Bhandari, J. G.; Muller, N. R.; Verlinde, C. L. M. J.; White, C. A.; Merritt, E. A.; Van Voorhis, W. C.; Maly, D. J. "Discovery of Potent and Selective Inhibitors of Calcium-Dependent Protein Kinase 1 (CDPK1) from *C. parvum* and *T. gondii*." *ACS Med. Chem. Lett.* **2010**, *1*, 331-335. (**DOI:** 10.1021/ml100096t)
8. Krishnamurty, R.; Maly, D. J. "Biochemical mechanisms of resistance to small-molecule protein kinase inhibitors" *ACS Chem. Biol.* **2010**, *5*, 121-138. (**DOI**: 10.1021/cb9002656)
9. Ranjitkar, P.; Brock, A. M.; Maly, D. J. "Affinity Probes that target a specific inactive conformation of protein kinases" *Chem. Biol.* **2010**, *17*, 195-206. (**DOI:** 10.1016/j.chembiol.2010.01.008)
10. Goreshnik, I.; Maly, D. J. "A Small Molecule-Regulated Guanine Nucleotide Exchange Factor" *J. Am. Chem. Soc*. **2010**, *132***,** 938-940. (**DOI**: 10.1021/ja907886v)
11. Hill, Z. B.; Perera, B. G. K.; Maly, D. J. "A Chemical Genetic Method for Generating Bivalent Inhibitors of Protein Kinases." *J. Am. Chem. Soc.* **2009**, *131*, 6686. (**DOI**: 10.1021/ja900871y)
12. Seeliger, M. A.; Ranjitkar, P.; Kasap. C.; Shan, Y.; Shaw, D. E.; Shah, N. E.; Kuriyan, J.; Maly, D. J. "Equally Potent Inhibition of c-Src and Abl by Compounds that Recognize Inactive Kinase Conformations" *Cancer Res.* **2009**, *69*, 2384 (**DOI**: 10.1158/0008-5472.CAN-08-3953).
13. Blacken, G. R.; Volný, M.; Diener, M.; Jackson, K. E.; Ranjitkar, P.; Maly, D. J.; Tureček, F. "Reactive Landing of Gas-Phase Ions as a Tool for the Fabrication of Metal Oxide Surfaces for in situ Phosphopeptide Enrichment" *J. Am. Soc. Mass Spectrom.* **2009**, 915. (**DOI**: 10.1016/j.jasms.2009.01.006).
14. Statsuk, A. V.; Maly, D. J.; Seeliger, M. A.; Fabian, M. A.; Biggs, W. H.; Lockhart, D. J.; Zarrinkar, P. P.; Kuriyan, J.; Shokat, K. M. "Tuning a three-component reaction for trapping kinase substrate complexes." *J. Am. Chem. Soc.* **2008**, *130*, 17568. (**DOI**: 10.1021/ja807066f)
15 Perera, G.; Maly, D. J. "Design, Synthesis and Characterization of "Clickable" 4-Anilinoquinazoline Kinase Inhibitors" *Mol. BioSyst.* **2008**, *4*, 542. (**DOI**: 10.1039/b720014e)
16. Krishnamurty, R.; Maly, D. J. "Chemical Genomic and Proteomic Methods for Determining Kinase Inhibitor Selectivity" *Comb. Chem. High Throughput Screening* **2007** *10,* 652.

17. Maly, D. J. "Exploring the Intermembrane Space" *ACS Chem. Biol.* **2007**, 2, 213.
18. Gosalia, D. N.; Salisbury, C. M.; Maly D. J.; Ellman, J. A.; Diamond, S. L. "Profiling Serine Protease Substrate Specificity with Solution Phase Fluorogenic Peptide Microarrays" *Proteomics* **2005**, *5*, 1292-1298.
19. Maly, D. J.; Allen, J. A.; Shokat, K. M. "A Mechanism-Based Cross-Linker for the Identification of Kinase-Substrate Pairs" *J. Am. Chem. Soc*. **2004**, 126, 9160-9161.
20. Kehoe, J. W.; Maly, D. J.; Verdugo, D. E.; Armstrong, J. I.; Cook, B. N.; Moore, K. L.; Ellman, J. A.; Bertozzi, C. R. "Tyrosyl Protein Sulfotransferase Inhibitors Generated by Combinatorial Target-Guided Ligand Assembly" *Bioorg. Med. Chem. Lett.* **2002**, *12*, 329-332.
21. Maly, D. J.; Leonetti, F.; Backes, B. J.; Dauber, D. S.; Harris, J. L.; Craik, C. S.; Ellman, J. A. "Expedient Solid-Phase Synthesis of Fluorogenic Protease Substrates Using the 7-Amino-4-Carbamoylmethylcoumarin (ACC) Fluorophore" *J. Org. Chem.* **2002**, *67*, 910-915.
22. Dauber, D. S.; Ziermann, R.; Parkin, N.; Maly, D. J.; Mahrus, S.; Harris, J. L.; Ellman, J. A.; Petropoulos, C.; Craik, C. S. "Altered Substrate Specificity of Drug-Resistant HIV-1 Protease" *J. Virol.* **2002**, *76*, 1359-1368.
23. Salisbury, C. M.; Maly, D. J.; Ellman, J. A. "Peptide Microarrays for the Determination of Protease Substrate Specificity" *J. Am. Chem. Soc.* **2002**, *124*, 14868-14870.
24. Maly, D. J.; Huang, L.; Ellman, J. A. "Combinatorial Strategies for Targeting Protein Families. Application to the Proteases" *ChemBioChem* **2002**, *3*, 16-37.
25. Maly, D. J.; Choong, I. C.; Ellman, J. A. "Combinatorial Target-Guided Ligand Assembly: Identification of Potent Subtype-Selective c-Src Inhibitors" *Proc. Natl. Acad. Sci. USA* **2000**, *97*, 2419-2424.

VI. Grant Activity:

R01GM086858 (Maly) 09/28/2008–09//27/2013 3.00 calendar
NIH/NIGMS $200,000(direct)/year
New Molecular Probes for Protein Kinases

R01GM086858-S1 06/15/2010–05/31/2011
NIH/NIGMS $99,999(direct)
New Molecular Probes for Protein Kinases (PI)

R01 AI 080625 (Van Voorhis) 06/01/2009 – 05/30/2013 1.00 calendar
NIH/NIAID $76,000(direct)/year (Maly portion)
Glycogen Synthase Kinase-3 as a Drug Target for Trypanosoma Brucei

R01AI089441 (Van Voorhis) 07/01/2010-06/30/2015 1.00 calendar
NIH/NIAID $110,000(direct)/yr (Maly portion)
CDPK1 as a drug target for *T. gondii* and *C. parvum*
Role: Co-PI

NSF Career 0954242 (**Maly**) 06/01/2010-05/30/2015 1.00 calendar
Small-Molecule-Regulated Signaling Proteins $130,000/yr
Role: PI

Alfred P. Sloan Research Fellowship 02/15/2011-02/14/2013
Sloan Research Foundation $50,000 (2 years)

VII. Honors and Awards:

NSF CAREER Award (2010)
Alfred P. Sloan Research Fellowship (2011)

Summary of Selected Professional Activities

Name: David J. Masiello — Date of Revised Vitae: 6/2011
Rank: Assistant Professor — Date of Ph.D.: 5/2004 — Date of UW hire: 9/2010 — Date of last promotion: N/A

I. Courses Taught (only list course number & times taught, e.g. "CHEM 142 (12)"):

CHEM 399 (3)
CHEM 457 (3)
CHEM 475 (1)
CHEM 550 (1)
CHEM 595 (1)
CHEM 600 (1)
AMATH 301 (2)

II. Department and University Service:

Departmental Committees:

2nd year exam committee in physical chemistry (2010-2011)
Graduate student recruitment committee (2010-present)

College and University Committees:

none

6 Total Other Graduate Supervisory Committees: (does not include students in own group)

III. Research Group (current):

3	graduate students	0	Postdoctoral associates	0	Ph.D.s granted (career total)
3	undergraduate students	0	other Visiting Faculty		

IV. Invited Lectures (2010- present): career total 4

4. "Generalized Reduced Density Matrices in Molecular Plasmonics," Reduced Density Matrices in Quantum Chemistry and Physics as part of ACS National Meeting, Denver, CO (August 2011).
3. "Molecular Plasmonics Meets Phase Space," Advances in SERS and Molecular Plasmonics as part of ACS National Meeting, Denver, CO (August 2011).
2. "New Theoretical Directions in Molecular Plasmonics," Center for Nanotechnology Seminar, University of Washington, Seattle, WA (January 2011).
1. "Exploring the Interaction of Molecular and Plasmonic Resonances from a Practical and Rigorous Theoretical Perspective," Physical Chemistry of Interfaces and Nanomaterials IX as part of SPIE Nanoscience + Engineering, San Diego, CA (August 2010).

V. Publications: career total [10] in press [1] submitted [2] book chapters, reviews [0]

15. Nicholas W. Bigelow and David J. Masiello, "Guiding of near-IR radiation in metallic nanoparticle rings," *in preparation* (2011).

14. Kirsty Leong, Yeechi Chen, Dirk Weiss, Melvin T. Zin, Hong Ma, David J. Masiello, David S. Ginger, and Alex K.-Y. Jen, "Broad continua of diffracted light in periodic gold nanodisk arrays," *in preparation* (2011).

13. Jonathan P. Litz, Jon P. Camden, and David J. Masiello, "Spatial, spectral, and coherence mapping of single-molecule SERS active hot spots," *under review* at Journal of Physical Chemistry Letters (2011).

12. N. Harris, L. K. Ausman, J. M. McMahon, D. J. Masiello, and G. C. Schatz, "Computational Electrodynamics Methods" in *Computational Nanoscience*, Bichoutskaia, E., Ed., RSC Theoretical and Computational Chemistry Series, Royal Society of Chemistry: Cambridge, UK, Vol. 4, *in press* (2011).

11. David J. Masiello and William P. Reinhardt, "Symmetry-breaking self-consistent quantum many-body structure of high-lying macroscopic self-trapped and superposition states of the gaseous double-well BEC," *under review* (2011).

10. Kirsty Leong, Yeechi Chen, David J. Masiello, Melvin T. Zin, Marketa Hnilova, Hong Ma, Mehmet Sarikaya, David S. Ginger, Alex K.-Y. Jen, "Cooperative near-field surface-plasmon enhanced quantum dot nanoarrays," Advanced Functional Materials 20, 2675 (2010).

9. David J. Masiello and George C. Schatz, "On the linear response and scattering of an interacting molecule-metal system," Journal of Chemical Physics 132, 064102 (2010).
   - This article has been selected for the February 2010 issue of the Virtual Journal of Nanoscale Science & Technology.

8. Jon A. Dieringer, Kristin L. Wustholz, David J. Masiello, Jon P. Camden, Samuel L. Kleinman, George C. Schatz, Richard P. Van Duyne, "Surface-enhanced Raman excitation spectroscopy of a single Rhodamine 6G molecule," Journal of the American Chemical Society 131, 849 (2009).

7. David J. Masiello and George C. Schatz, "Many-body theory of surface-enhanced Raman scattering," Physical Review A 78, 042505 (2008).

6. Jon P. Camden, Jon A. Dieringer, Yingmin Wang, David J. Masiello, Lawrence D. Marks, George C. Schatz, and Richard P. Van Duyne, "Probing the structure of single molecule surface-enhanced Raman scattering hot spots," Journal of the American Chemical Society (Communications) 130, 12616 (2008).

5. David J. Masiello and William P. Reinhardt, "Time-dependent quantum many-body theory of identical bosons in a double well: Early-time ballistic interferences of fragmented and number entangled states," Physical Review A 76, 043612 (2007).
   - This article has been selected for the October 2007 issue of the Virtual Journal of Quantum Information.

4. D. Masiello, S. B. McKagan, and W. P. Reinhardt, "Multiconfigurational Hartree-Fock theory for identical bosons in a double well," Physical Review A 72, 063624 (2005).

3. David Masiello, Erik Deumens, and Yngve Öhrn, "On the canonical formulation of electrodynamics and wave mechanics," Advances in Quantum Chemistry 49, 249 (2005).

2. D. Masiello, E. Deumens, and Y. Öhrn, "Dynamics of an atomic electron and its electromagnetic field in a cavity," Physical Review A 71, 032108 (2005).

1. Steven A. MacDonald, Craig R. Schardt, David J. Masiello, and Joseph H. Simmons, "Dispersion analysis of FTIR reflection measurements in silicate glasses," Journal of Non-Crystalline Solids 275, 72-82 (2000).

VI. Grant Activity:

Current

University of Washington Student Technology Fee (PI: Hopkins) *Chemistry Study Center Computer Upgrade*	2011	$40,569.75
University of Washington Royalty Research Fund (PI) *Controlling Molecular Optical Response Guided by High-Resolution Near-Field Imaging*	2011	$33,549

Pending

American Chemical Society Petroleum Research Fund (PI) *Enhanced Solar-Energy Conversion through the Design of Novel Plasmonic Chromophores*	2010
National Science Foundation Division of Materials Research (PI: Sarikaya) *CEMRI: Bioenabled Nanophotonics* thrust of *Genetically Engineered Materials Science and Engineering Center-II*	2011
Air Force Office of Scientific Research (PI: Sarikaya) *MURI: Peptide-Enabled Self-Assembled Reconfigurable, Hybrid Nanostructures*	2010

Applied

Army Research Laboratory (PI: Robinson) *MSME: Multi-scale Modeling of Electronic Materials*	2011
National Science Foundation (PI: Hopkins) *CRIF:MU Computer Cluster for Theoretical and Computational Chemistry*	2010

VII. Honors and Awards:

2004	Procter & Gamble graduate research award, University of Florida
1999	1st place, CLAS Research Symposium, University of Florida
1998	National Science Foundation REU in optics, Université Bordeaux 1
1995-1999	Florida Academic Scholar, University of Florida

VIII. Additional Comments on Research, Teaching, and Service:

Referee
Nanotechnology
Physical Review Letters
Journal of Chemical Physics
Physical Review A
Journal of Physical Chemistry
Journal of Physical Chemistry Letters
International Journal of Quantum Chemistry
Physics Letters A

Reviewer
Research Grant Council of Hong Kong

Conference Organization
Session chair, ACS National Meeting, Denver, CO (Fall 2011)

Professional Memberships
American Physical Society
American Chemical Society

Mentorship
Graduate and undergraduate student mentor
Math Academy mentor (Summer 2011)

Major Awards received by Masiello students
National Science Foundation Graduate Research Fellowship, awarded to graduate student Jonathan Litz (2011)

Summary of Selected Professional Activities

Name: Bo Zhang Date of Revised Vitae: 06/01/11
Rank: Assistant Professor Date of Ph.D.: 08/2006 Date of UW hire: 09/2008 Date of last promotion:

I. Courses Taught (only list course number & times taught, e.g. "CHEM 142 (12)"):

CHEM 152 (2)
CHEM 520 (3)
CHEM 426 (1)

II. Department and University Service:

Departmental Committees:

Graduate Recruiting Committee (2008-present)

College and University Committees:

none

15 Total Other Graduate Supervisory Committees: (does not include students in own group)

III. Research Group (current):

4	graduate students		Postdoctoral associates		Ph.D.s granted (career total)
3	undergraduate students		other Visiting Faculty		

IV. Invited Lectures: career total 17

2011

"*Counting Single Redox Events with Photons*" Southwest ACS regional meeting, Austin, TX, **11/10/2011.**

"*Electrochemistry and Electrocatalysis at Single Au Nanoparticles*" BCEIA 2011 meeting, Beijing, China, **10/12/2011.**

"*Electrochemical Catalysis at Single Au Nanoparticles*" 2011 Catalysis Science Program Meeting, US Department of Energy, Washington, DC, **10/2/2011.**

"*Counting Single Redox Events with Photons*" 7th Potter's Lodge Meeting on Electrochemistry, Blue Mountain Lake, NY, **09/07/2011.**

"*Nanoelectrochemical Methods for Single Nanoparticles and Single Molecules*" Department of Chemistry, University of Texas, Austin, TX, **02/19/2011.**

"*New Electrochemical Methods toward Single Redox Molecules and High resolution Imaging*" Department of Chemistry, University of Utah, Salt Lake City, **02/28/2011.**

"*Electrochemical Response of Single Nanoparticles*" Pittcon, Atlanta, GA, **03/13/2011.**

2010

"DNA Sequencing with a Graphene Nanopore" NIH NHGRI Meeting, Chapel Hill, NC, **03/10/2010.**

"*DNA translocation through solid nanochannels*" Pittcon, Orlando, FL, **03/02/2010**.

"*Electrochemistry and Electrocatalysis at Single Nanoparticles*" Pittcon, Orlando, FL, **03/01/2010.**

"*Nanopore-based Artificial Ion-Channel Sensors for Monitoring Cell Secretion*" Pittcon, Orlando, FL, **02/28/2010.**

2009

"*Electrocatalysis at Single Metal Nanoparticles*" Pittcon, Chicago, IL, **03/10/2009.**

"*Electrochemistry and Electrocatalysis of Single Metal Nanoparticles*" Department of Chemistry, University of Idaho, Moscow, Idaho, **12/01/2009.**

"*Electrochemistry and Electrocatalysis at Single Metal Nanoparticles*" 6th Potter's Lodge Meeting on Electrochemistry, Blue Mountain Lake, New York, **09/09/2009.**

"*Electrochemistry and Electrocatalysis at Single Metal Nanoparticles*" Department of Chemistry, Univ. of Washington, Nanotechnology Seminar, Seattle, WA, **02/17/2009.**

"*Electron Transfer and Single-Cell Detection using Nano/Micro-sized Electrodes*" Department of Physics, Seattle, WA, **12/2/2009.**

2008

"*Microelectrode Arrays for Single Neurons*" 12th International Conference on in-vivo methods, Vancouver, BC, Canada, **08/12/2008.**

V. Publications: career total [24] in press [ ] submitted [ ] book chapters, reviews [1]

1. Lan, W. J.; Holden, D. A.; Zhang, B.; White, H. S.* "Nanoparticle Transport in Conical-Shaped Nanopores" *Anal. Chem.*, **2011**, *83*, 3840–3847.
2. Kwon, S. J.; Zhou, H. J.; Fan, F. F-R.; Vorobyev, V.; Zhang, B.; and Bard, A. J.* "Stochastic electrochemistry with electrocatalytic nanoparticles at inert ultramicroelectrodes-theory and experiments" *Phys. Chem. Chem. Phys.*, **2011**, *13*, 5394-5402.
3. Adams, K. L.; Jena, B. K.; Percival, S. J.; Zhang, B.;* "Highly-Sensitive Detection of Exocytotic Dopamine Release using a Gold-Nanoparticle-Network Microelectrode" *Anal. Chem.* **2011**, *83*, 920-927.
4. Zhang, B.; Heien, M. L. A. V.; Santillo, M. F.; Mellander, L.; Ewing, A. G.;* "Temporal Resolution in Electrochemical Imaging on Single PC12 Cells Using Amperometry and Voltammetry at Microelectrode Arrays" *Anal. Chem.* **2011**, *83*, 571-577.
5. Guerrette, J. P.; Zhang, B.* "Scan-Rate Dependent Current Rectification of Cone-Shape Silica Nanopores in Quartz Nanopipettes" *J. Am. Chem. Soc.* **2010**, *132*, 17088-17091.
6. Jena, B. K.; Percival, S. J.; Zhang, B.* "Au Nanoelectrode by Electrochemical Deposition in a Nanopore" *Anal. Chem.* **2010**, *82*, 6737-6743.
7. Nelson, T.; Zhang, B.; and Prezhdo, O. V.* "Detection of Nucleic Acids with Graphene Nanopores: Ab Initio Characterization of a Novel Sequencing Device" *Nano Lett.* **2010**, *10*, 3237-3242.
8. Li, Y.; Cox, J. T.; and Zhang, B.* "Electrochemical Response and Electrocatalysis at single Au Nanoparticles" *J. Am. Chem. Soc.* **2010**, *132*, 3047-3052.
9. Adams, K. L.; Engelbrektsson, J.; Voinova, M.; Zhang, B.; Eves, D. J.; Karlsson, R.; Heien, M.; Cans, A. S.; Ewing, A. G.* "Steady-State Electrochemical Determination of Lipidic Nanotube Diameter Utilizing an Artificial Cell Model" *Anal. Chem.* **2010,** *82*, 1020-1026.
10. Zhang, B.;* Wood, M.; Lee, H. "A Silica Nanochannel and Its Applications in Sensing and Molecular Transport" *Anal. Chem.* **2009,** *81*, 5541-5548.
11. Li, Y.; Bergman, D.; and Zhang, B.* "The Preparation and Electrochemical Response of 1-3 nm Pt Electrodes" *Anal. Chem.* **2009**, *81*, 5496-5502.
12. Zhang, B.; Adams, K. L.; Luber, S.; Heien, M., Ewing, A. G. "Spatially and Temporally Resolved Single-Cell Exocytosis with Individually-Addressable Carbon Microelectrode-Arrays" *Anal. Chem.* **2008**, *80*. 1394-1400. (Accelerated Article)
13. Zhang, B.; Galusha, G.; Shiozawa, P. G.; Wang, G.; Bergren, A. J.; Johns, R. M.; White, R. J.; Ervin E. N.; Cauley, C. C.; White, H. S. "A Bench-Top Method for Fabricating Glass-Sealed Nanodisk Electrodes, Glass Nanopore Electrodes, and Glass Nanopore Membranes of Controlled Size" *Anal. Chem.* **2007**, *79*, 4778-4787. (Accelerated Article)
14. White, R. J.; Zhang, B.; Daniel, S.; Tang, J.; Ervin, E. N.; Cremer, P. S.; White, H. S. "Ionic Conductivity of the Aqueous Layer Separating a Lipid Bilayer Membrane and a Glass Support" *Langmuir*. **2006**, 22, 10777-10783.

15. Wang, G. L.; Zhang, B.; Wayment, J. R.; Harris, J. M.; White, H. S. "Electrostatic-Gated Transport in Chemically Modified Glass Nanopore Electrodes" *J. Am. Chem. Soc.* **2006**, *128*, 7679-7686.

17. Zhang, B.; Zhang, Y.; White, H. S. "Steady-State Voltammetric Response of the Nanopore Electrode" *Anal. Chem.* **2006**, *78*, 477-483.

18. Zhang, Y.; Zhang, B.; White, H. S. "Electrochemistry of Nanopore Electrodes in Low Ionic Strength Solutions" *J. Phys. Chem. B.* **2006**, *110*, 1768-1774.

19. Watkins, J. J.; Zhang, B.; White, H. S. "Electrochemistry at Nanometer-Scaled Electrodes" *J. Chem. Edu.* **2005**, *82*, 712-719

20. Zhang, B.; Zhang, Y.; White, H. S. "The Nanopore Electrode" *Anal. Chem.* **2004**, *76*, 6229-6238.

VI. Grant Activity:

Pending Grant Applications:

NIH RO1 (PI)	New Electroanalytical Methods for Single-Cell Exocytosis	$1,638,275
DOE (PI)	Electrostatically Gated Separations in Single Silica Nanochannels	$607,620
DTRA (Co-PI)	Single Molecule and Zeptomolar Analysis	$500,000

Current Grants:

UW Bridge (PI)	Single-Cell Exocytosis and Single-Nanoparticle Electrochemistry	$100,000
UW RRF (PI)	Single Nanoparticle Electrochemistry	$30,000

VII. Honors and Awards:

2011 Faculty Development Award, University of Washington
2010 Royalty Research Award, University of Washington
2007 Gordon Research Conference on Electrochemistry Travel Award
2006 Gordon Research Conference on Electrochemistry Travel Award
2006 University of Utah Graduate Travel Award
2005 ACS Analytical Division Graduate Research Fellowship
2005 Chinese Government Award for Outstanding Students Abroad
2001 Wusi Fellowship, Peking University
1998 Student Scholarship, Shandong University

VIII. Additional Comments on Research, Teaching, and Service:

Summary of Selected Professional Activities

Name: Forrest Michael — Date of Revised Vitae: 6/2011
Rank: Associate Professor — Date of Ph.D.: 2001 — Date of UW hire: 2004 — Date of last promotion: 2010

I. Courses Taught (only list course number & times taught, e.g. "CHEM 142 (12)"):

Chem 335 (3), Chem 237 (5), Chem 531 (6)
Evaluations (adjusted median, all items): 3.8, 5.1, 4.1, 4.4, 4.5, 4.7, 4.7, 5.0, 4.8, 4.4, 5.2, 4.8, 5.1, 4.9; average: 4.7

II. Department and University Service:

Departmental Committees:

Graduate Admissions and Good Standing (2008-present)
Graduate Applications and Recruiting (2004-09, chair 2007-08)
Sophomore Organic (2008-present)
Safety (2009-present)
Faculty Search

College and University Committees:

none

44 Total Other Graduate Supervisory Committees: (does not include students in own group)

III. Research Group (current):

8	graduate students	0	Postdoctoral associates	4	Ph.D.s granted (career total)
1	undergraduate students	0	other Visiting Faculty		

IV. Invited Lectures: career total 21

21. University of California, Department of Chemistry seminar, Davis, CA, April 2011
20. Amgen, Medicinal Chemistry seminar, South San Francisco, CA, May 2010
19. ACS National Meeting, Young Academic Investigators Symposium, Washington, DC, August 2009
18. Amgen, Process Chemistry seminar, Thousand Oaks, CA, April 2009
17. University of California, Department of Chemistry seminar, Los Angeles, CA, April 2009
16. Joint Science Department of the Claremont Colleges, seminar, Claremont, CA, April 2009
15. University of Illinois-Chicago, Department of Chemistry seminar, Chicago, IL, April 2009
14. Northwestern University, Department of Chemistry seminar, Evanston, IL, April 2009
13. Colorado State University, Department of Chemistry seminar, Fort Collins, CO, April 2009
12. University of North Carolina-Chapel Hill, Department of Chemistry seminar, Chapel Hill, NC, March 2009
11. University of Texas-Austin, Department of Chemistry seminar, Austin, TX, February 2009
10. Western Washington University, Department of Chemistry seminar, Bellingham, WA, February 2009
9. Exelixis, Medicinal Chemistry seminar, South San Francisco, CA, October 2008

8. University of California-Berkeley, College of Chemistry seminar, Berkeley, CA, October 2008

7. University of Texas-Southwestern Medical Center, Department of Biochemistry seminar, Dallas, TX, September 2008

6. Organic Reactions and Processes Gordon Research Conference, Smithfield, RI, July 2008

5. Eli Lilly, seminar, Indianapolis, IN, June 2008

4. Robert N. Young Lectures in Organic Chemistry, University of British Columbia, Vancouver, British Columbia, Canada, April 2008

3. Bristol Myers Squibb, Process Chemistry seminar, New Brunswick, NJ, October 2007

2. Rutgers University, Department of Chemistry & Chemical Biology seminar, Piscataway, NJ, October 2007

1. Brown University, Department of Chemistry seminar, Providence, RI, March 2007

V. Publications: career total [15] in press [ ] submitted [ ] book chapters, reviews [ ]

UW publications only:

15. Liskin, D. V.; Sibbald, P. A.; Rosewall, C. F.; Michael, F. E. "Palladium Catalyzed Alkoxyamination of Alkenes with Use of *N*-Fluorobenzenesulfonimide as Oxidant" *J. Org. Chem.* **2010**, *75*, 6294-6296.

14. Siegel, J. B.; Zanghellini, A.; Lovick, H. M.; Kiss, G.; Lambert, A. R.; St.Clair, J. L.; Gallaher, J. L.; Hilvert, D.; Gelb, M. H.; Stoddard, B.; Houk, K. N.; Michael, F. E.; Baker, D. "Computational design of an enzyme catalyst for a stereoselective bimolecular Diels-Alder reaction", *Science* **2010**, *329*, 309-313.

13. Hoover, J. M.; DiPasquale, A.; Mayer, J. M.; Michael, F. E.; "Platinum Catalyzed Intramolecular Hydrohydrazination: Evidence for Alkene Insertion into a Pt-N Bond", *J. Am. Chem. Soc.* **2010**, *132*, 5043-5053.

12. Lovick, H. M.; Michael, F. E. "Metal-Free Highly Regioselective Aminotrifluoroacetoxylation of Alkenes", *J. Am. Chem. Soc.* **2010**, *132*, 1249-1251.

11. Sibbald, P. A.; Rosewall, C. F.; Swartz, R. D.; Michael, F. E. "Mechanism of *N*-Fluorobenzenesulfonimide Promoted Diamination and Carboamination Reactions: Divergent Reactivity of a Pd(IV) Species", *J. Am. Chem. Soc.*, **2009**, *131*, 15945-15951.

10. Rosewall, C. F.; Sibbald, P. A.; Liskin, D. V.; Michael, F. E. "Palladium Catalyzed Carboamination of Alkenes Promoted by *N*-Fluorobenzenesulfonimide via C-H Activation of Arenes" *J. Am. Chem. Soc.* **2009**, *131*, 9488-9489.

9. Sibbald, P. A.; Michael, F. E. "Palladium-Catalyzed Diamination of Unactivated Alkenes Using *N*-fluorobenzenesulfonimide as a Source of Electrophilic Nitrogen" *Org. Lett.* **2009**, *11*, 1147-1149.

8. Lovick, H. M.; Michael F. E. "Reversal of enantioselectivity using tethered bisguanidine catalysts in the aza-Henry reaction" *Tetrahedron Lett.* **2009**, *50*, 1016-1019.

7. Cochran, B. M.; Michael, F. E. "Metal-free Oxidative Cyclization of Urea-Tethered Alkenes with Hypervalent Iodine" *Org. Lett.* **2008**, *10*, 5039-5042.

6. Hoover, J. M.; Freudenthal, J.; Michael, F. E.; Mayer, J. M. "Reactivity of low-valent Ir, Rh, and Pt complexes with di- and tetrasubstituted hydrazines" *Organometallics* **2008**, *27*, 2238-2245.

5. Sibbald, P. A.; Cochran, B. M.; Michael, F. E. "Palladium-Catalyzed Intramolecular Chloroamination of Alkenes" *Org. Lett.* **2008**, *9*, 793-796.

4. Cochran, B. M.; Michael, F. E. "Synthesis of 2,6-Disubstituted Piperazines by a Diastereoselective Palladium-Catalyzed Hydroamination Reaction" *Org. Lett.* **2008**, *9*, 329-332.

3. Cochran, B. M.; Michael, F. E. "Mechanistic Studies of a Palladium Catalyzed Intramolecular Hydroamination of Unactivated Alkenes: Protonolysis of a Stable Palladium Alkyl Complex is the Turnover-limiting Step" *J. Am. Chem. Soc.* **2008**, *130*, 2786-2792.

2. Hoover, J. M.; DiPasquale, A.; Mayer, J. M.; Michael, F. E. "Synthesis and Reactivity of a Ru^{III} bis(anilide) Dimer by Oxidative Addition of an *N,N'*-disubstituted Hydrazine" *Organometallics* **2007**, *26*, 3397-3405.

1. Michael, F. E.; Cochran, B. M. "Room-Temperature Palladium-Catalyzed Intramolecular Hydroamination of Unactivated Alkenes" *J. Am. Chem. Soc.* **2006**, *128*, 4246-4248.

Pre-UW publications:

8. Blum, S. A.; Rivera, V. A.; Ruck, R. T.; Michael, F. E.; Bergman, R. G. "Synthetic and Mechanistic Studies of Strained Heterocycle Opening Reactions Mediated by Zirconium(IV) Imido Complexes" *Organometallics* **2005**, *24*, 1647-1659.

7. Michael, F. E.; Duncan, A. P.; Sweeney, Z. K.; Bergman, R. G. "Rearrangements and Stereomutations of Metallacycles Derived from Allenes and Imidozirconium Complexes," *J. Am. Chem. Soc.* **2005**, *127*, 1752-1764.

6. Hoyt, H. M.; Michael, F. E.; Bergman, R. G. "C-H Bond Activation of Hydrocarbons by an Imidozirconocene Complex," *J. Am. Chem. Soc.* **2004**, *126*, 1018-1019.

5. Michael, F. E.; Duncan, A. P.; Sweeney, Z. K.; Bergman, R. G. "Mechanisms of Allene Stereoinversion by Imidozirconium Complexes," *J. Am. Chem. Soc.* **2003**, *125*, 7184-7185.

4. Evans, D. A.; Michael, F. E.; Tedrow, J. S.; Campos, K. R. "Application of Chiral Mixed Phosphorus/Sulfur Ligands to Enantioselective Rhodium-Catalyzed Dehydroamino Acid Hydrogenation and Ketone Hydrosilylation Processes," *J. Am. Chem. Soc.* **2003**; *125*; 3534-3543

3. Evans, D. A.; Campos, K. R.; Tedrow, J. S.; Michael, F. E.; Gagne, M. R. "Application of Chiral Mixed Phosphorus/Sulfur Ligands to Palladium-Catalyzed Allylic Substitutions," *J. Am. Chem. Soc.* **2000**, *122*, 7905.

2. Evans, D. A.; Campos, K. R.; Tedrow, J. S.; Michael, F. E.; Gagne, M. R. "Chiral Mixed Phosphorus/Sulfur Ligands for Palladium-Catalyzed Allylic Alkylations and Aminations," *J. Org. Chem.* **1999**, *64*, 2994.

1. Fitzgerald, J. J.; Michael, F. E.; Olofson, R. A. "Reaction of Benzocyclobutenoxides with Nitriles: Synthesis of Hypecumine and Other 3-Substituted Isoquinolines," *Tetrahedron Lett.* **1994**, *35*, 9191.

VI. Grant Activity:

2008 DARPA (PI: David Baker)

2008 NSF CAREER Award

2006 American Chemical Society, Petroleum Research Fund – Type G – "Catalytic Diamination of Alkenes"

2006 Royalty Research Fund – "Bronsted Acid Catalysis"

VII. Honors and Awards:

2008 National Science Foundation CAREER Award

2006 Thieme Journal Award

2002-2004 National Institutes of Health Post-Doctoral Fellowship

1995-1998 National Science Foundation Graduate Fellowship

1991 International Chemistry Olympiad Team Member, Gold Medal, 12th place

VIII. Additional Comments on Research, Teaching, and Service:

2007-08 Finalist for UW Distinguished Teaching Award

Summary of Selected Professional Activities

Name: Werner Kaminsky Date of Revised Vitae: 5/16/2011

Rank: Rsch. Assoc. Prof. Date of Ph.D.: 1st 1990 '2nd' (habil) 2000 Date of UW hire: 2000 Date of last promotion: N/A

I. Courses Taught:

CHM 190 A	Summer 2011 5-credits, "Diving Deep: X-Ray Crystallography and the Inside of Crystals"
BSTR 515	7 times, 1-credit, X-ray lab, 2004-2010
GEN ST 197	AUTUMN 2002, Freshman Seminar, 1-credit: " Diving Deep: X-ray structure determination"
GEN ST 391	Spring 2001 3-credits, "Crystal structure determination",
GEN ST 391	Summer 2001 3-credits, "Mathematical tools and crystallographic computing",
GEN ST 391	Fall 2001 3-credits, "Physical properties of crystals"

II. Department and University Service:

Departmental Committees:

Research Service Committee

College and University Committees:

Faculty Council for Educational Technology, 2004-05, chair 2005-09
Faculty Senate 2006-09
Senate Executive Committee 2006-09;
University Technology Advisory Committee 2006-08

[6] Total Other Graduate Supervisory Committees: (does not include students in own group)

III. Research Group (last 10 years):

[ ] graduate students	[ ] Postdoctoral associates	[ ] Ph.D.s granted (career total)
[12] undergraduate students	[5] other Visiting Faculty	

IV. Invited Lectures: career total [52]

24. 11/29/2000, Univ. Cologne, *Germany*: Gefaerbte Kristalle.
25. 8/13/2001-24.8.2001, Univ. Köln, *Germany*: 10 lectures on "Gyrooptische Eigenschaften in Kristallen".
26. 4/5/2002, Univ. de La Laguna, Tenerife, *Spain*: 3 lectures, "Non-linear optical tensors", "NLO in mannitol", and "Optical rotation imaging".
27. 7/1/2002-7/5/2002, Univ. Köln, *Germany*: 5 lectures on "Kristallogr. Aspekte von Phasenumwandlungen".
28. 11/4/2002, CPAC, Seattle*:* A fast microscope for unfolded images of birefringence, extinction, and transmission.
29. 8/16/2003, Symmetry 2003, Budapest, *Hungary*: A chirality microscope?.
30. 5/4/2003, CPAC, Seattle*:* A fast microscope to measure birefringence and eigenray directions.
31. 12/15/2003 - 12/20/2003, Univ. Köln, *Germany*: 5 lectures on "3-D Darstellung und 'virtual reality' Programmierung kristallopgraphischer Objekte".
32. 12/17/2003, Univ. Köln, *Germany*: Forschen unter Amerikanischen Bedingungen
33. 5/2/2004, CPAC, Seattle: Search for applications for 'Millipol', a fast quantitative polarimetric imaging technique.
34. 1/6/2004, Univ. Dortmund, *Germany*: Forschen unter Amerikanischen Bedingungen.
35. 10/22/2004, Univ. Washington., Seattle: New developments in optical microscopy
36. 10/27/2004, Univ. Washington., Seattle: New microscopic tools to study linear and nonlinear optical properties of materials: new ways to measure EO activity of materials
37. 11/15/2004 – 11/19/2004, Univ. Köln, *Germany*: 5 lectures on "3-D Darstellung und 'virtual reality' Programmierung kristallopgraphischer Objekte"
38. 11/16/004, Inst. F. Kristallogr. RWTH Aachen, *Germany*: Abbildung kristalliner Eigenschaften
39. 2/10/2005, STC Retreat, Georgia Tech, Atlanta: Electro-optic imaging
40. 8/24/2005, IUCr, Florence, *Italy*: Optical topographies of chiral structures
41. 11/29/.2005, Syracuse University, New York: Optical topographies of chiral structures
42. 8/12/2006, Symmetry 2006, Budapest, *Hungary:* From *.cif to virtual morphology
43. 9/13/2006, Emerald Biosystems, Washington: Search for applications for 'Millipol', a fast quantitative polarimetric imaging technique
44. 11/29/2006, Univ. Polytecnica Madrid, *Spain*: Optical topographies of chiral structures
45. 7/26/2007, ACA, Salt Lake City, Utah: Virtual Reality in PowerPoint Presentations with Objects Created with WinXMorph and WinTensor

46. 2/11/2008, Portland State University: New optical microscopies
47. 6/4/2008, ACA, Knoxville, Tennessy: Synthesis, Structures, Morphologies and Optical properties of some new chiral thiocarbamates and thioureas
48. 1/26/2009, Johns Hopkins Univ., Baltimore: Chiro-optics of crystals and molecules
49. 3/31/2009, Workshop, Massy (Paris), *France*: Real-time Birefringence Measurements and other Optical Properties
50. 5/22/2010, NWBS, Seattle: Bone collagen fibers orientation assessment using birefringence measurements.
51. 9/23/2010, Kansas State University, Manhattan, Kansas: Real-time birefringence imaging
52. 4/13/2011, (ILSB) Vienna University of Technology, *Austria*: Real-time birefringence imaging

---

V. Publications: career total 139 in press 1 submitted 3 book chapters, reviews 5

82. W. Kaminsky: WinXMorph: a computer program to draw crystal morphology, growth sectors and cross-sections with export files in VRML V2.0 utf8-virtual reality format. J. Appl. Crystallogr. 38 (2005) 566-567.
83. W. Kaminksy, L.-W. Jin, S. Powell, I. Maezawa, K. Claborn, B. Kahr: Polarimetric Imaging of Amyloid. Micron 37 (2006) 324-338.
84. E. Gunn, R. Sours, J. Benedict, W. Kaminsky, B. Kahr: Mesoscale Chiroptics of Rhythmic Precipitates. JACS 128 (2006) 14234-14235.
85. K. Claborn, W. Kaminsky, J. Herreros-Cedres, E. Weckert, B. Kahr: Optical rotation of Achiral Pentaerythritol. JACS 128 (2006) 14746-14747.
86. W. Kaminsky, E. Weckert, H. Kutzke, M. A. Glazer, H. Klapper. Non-linear optical properties and absolute structure of metastable 4-methylbenzophenone. Z. Kristallogr. 221 (2006) 294-299.
87. W. Kaminksy, L.-W. Jin, S. Powell, I. Maezawa, K. Claborn, B. Kahr: Polarimetric Imaging of Amyloid. Micron 37 (2006) 324-38.
88. E. Gunn, R. Sours, J. Benedict, W. Kaminsky, B. Kahr: Mesoscale Chiroptics of Rhythmic Precipitates. JACS 128 (2006) 14234-35.
89. K. Claborn, W. Kaminsky, J. Herreros-Cedres, E. Weckert, B. Kahr: Optical rotation of Achiral Pentaerythritl. JACS 128 (2006) 14448-14449.
90. B. Carlson, G. D. Phelan, J. Benedict, W. Kaminsky, L. Dalton: Crystal structures and luminescence properties of osmium complexes of cis-1,2-vinylenebis(diphenylarsine) and pyridyl ligands. Possible evidence for metal d, ligand d backbonding. Inorganic Chemica Acta 359 (2006) 1093-1102
91. P. Lugo-Mas, Dey, A., Liang Xu, S. D. Davin, J. Benedict, W. Kaminsky, J. Kovacs: How does single oxygen addition affect the properties of an Fe-nitrile hydratase analogue? The compensatory role of the unmodified thiolate. JACS 128 (2006) 11211-11221
92. A. Wu, A. Dehestani, E. Saganic, T. J. Crevier, W. Kaminsky, D. E. Cohen, J. M. Mayer: Reactions of Tp-Os nitrido complexes with the nucleophiles hydroxide and thiosulfate. Inorganica Chimica Acta 359 (2006) 2842-2849
93. S.-H. Jang, J. Luo, N.M. Tucker, A. Leclercq, E. Zojer, M.A. Haller, T-D Kim, J-W Kang, K. Firestone, D. Bale, D. Lao, J.B. Benedict, D. Cohen, W. Kaminsky, B. Kahr, J-L. Bredas, P. Rheid, L.R. Dalton, A.K.-Y Jen: Pyrroline Chromophores for Electro-Optics. Chemistry of Materials 18 (2006) 2982-2988
94. T. Kitagawa, A., P. DeyLugo-Mas, J. B. Benedict, W. Kaminsky, E. Solomon, J Kovacs: A functional model for the cysteinate-ligated non-heme iron enzyme superoxide reductase (SOR). JACS 128 (2006) 14448-14449
95. W. Kaminsky: From *.cif to virtual morphology: new aspects of predicting crystal shapes as part of the WinXMorph program. J. Appl. Cryst., 40 (2007) 382-385.
96. C. J. Tonzola, A. P. Gifford, A. P. Kulkarni, W. Kaminsky, S. A. Jenekhe: Blue-Light-Emitting Oligoquinolines: Synthesis, Properties, and High-Efficiency Blue-Light-Emitting Diodesand High-Efficiency Blue-Light-Emitting Diodes. Advanced Functional Materials 17 (2007) 863-874.
97. A. Wu, J. Masland, R. D. Swartz, W. Kaminsky, J. M. Mayer Synthesis and Characterization of Ruthenium Bis(â-diketonato) Pyridine-Imidazole Comple-xes for Hydrogen Atom Transfer. Inorganic Chemistry 46 (2007) 11190-11201
98. L. M. Brines, J. Shearer, J. K. Fender, D. Schweitzer, S. C. Shoner, D. Barnhart, W. Kaminsky, S. Lovell, J. A. Kovacs: Periodic trends within a Series of Five Coordinate Thiolate-Ligated [M(II)(SN4(tren))] + (M = Mn, Fe, Co, Ni, Cu, Zn) Complexes, including a rare example of a stable CuII-thiolate. Inorg. Chem 46 (2007) 9267-9277.
99. W. Kaminsky, B. Kahr: Circular extinction contrast imaging microscope. Nov. 2007: **US Patent 7292389**
100. W. Kaminsky, E. Gunn, R. Sours, B. Kahr: Simultaneous false color imaging of birefringence, extinction, and transmittance at camera speed. J Microscopy. 228 (2008) 153-164.
101. L. M. Brines, G. Villar-Acevedo, T. Kitagawa, R. D. Swartz, P. Lugo-Mas, W. Kaminsky, J. B. Benedict, J. A. Kovacs: Comparison of Structurally-Related Alkoxide, Amine, and Thiolate-Ligated M(II) (M= Fe, Co) Complexes: the Influence of Thiolates on the Properties of Biologically Relevant Metal Complexes. Inorganica Chimica Acta 361 (2008) 1070-1078

102. B. Carlson, W. Kaminsky, B. Eichinger, G. D. Plelan: Complexes of Osmium with the 2-[(diphenylphosphanyl)-methyl]-pyridine ligand. J Phys. Chem. C 112 (2008) 7858-7865
103. A. Akeleitis, B. Olbricht, P. Sullivan, Y. Liao, S. Lee, D. Bale, D. Lao, W. Kaminsky, B. Eichinger, D. Choi, P. Reid, L. Dalton: Synthesis and electro-optic properties of amino-phenyl-thienyl donor chromophores. Optical Materials 30 (2008) 1504-1513
104. T. J. Hebden, M. C. Denny, V. Pons, P. M. B. Piccoli, T. F. Koetzle, A. J. Schultz, W. Kaminsky, K. I. Goldberg, D. M. Heinekey: σ-Borane Complexes of Iridium: Synthesis and Structural Characterization, JACS 130 (2008) 10812-10820
105. D.B. Williams, W. Kaminsky, J.M. Mayer, K.I. Goldberg: Reactions of Iridium hydride pincer complexes with dioxygen: new complexes and reversible O-2 binding. Chemical Communications 35 (2008) 4195-4197
106. D.F. Brayton, K.I. Goldberg, W. Kaminsky, D.M. Heinekey: A convenient one-pot synthesis of di-t-butylphosphinic chloride. Phosphorous Sulfur and Sillicon and the related Elements 183 (2008) 2534-2540
107. A. Rohl, M. Moret, W. Kaminsky, K. Claborn, B. Kahr: Hirshfeld Surfaces Identify Errors in Computations of Intermolecular Interactions in Crystals: Pentamorphic 1,8-dihydroxyanthraquinone crystal growth & design 8 (2008) 4517-4525
108. P. Lugo-Mas, W. Taylor, D. Schweitzer, R. M. Theisen, Liang Xu, J. Shearer, R. D. Swartz, M. C. Gleaves, A. DiPasquale, W. Kaminsky, J. Kovacs: Properties of Square-Pyramidal Alkyl-Thiolate Fe-III Complexes, including an analogue of the Unmodifies Form of Nitrile Hydratase. Inorganic Chemistry, 47 (2008) 11228-11236.
109. S. Bowles, B. Dooley, W. Kaminsky, J. Benedict, N. Frank: The Competing Roles of Topology and Spin Density in the Magnetic Behavior of Spin Delocalized Radicals: Donor-Acceptor Annelated Nitronyl Nitroxides. Polyhedron 28 (2009) 1704-1709.
110. C.R. Waidmann, X. Zhou, E.A. Tsai, W. Kaminsky, D.A. Hrovat, W.T. Borden, J.M.Mayer: Slow hydrogen transfer reactions of oxo- and hydroxo- vanadium compounds: the importance of intrinsic barriers. JACS 131 (2009) 4729-4743.
111. B. Kahr, Y. Bing, W. Kaminsky, D. Viterbo: Turinese Stereochemistry: Eligio Perucca's Enantioselectivity and Primo Levi's Asymmetry. Angewandte Chemie 121 (2009) 3798 (German edition) 48 (2009) 3744 (Inernational Edition)
112. B. Carlson, B. E. Eichinger, W. Kaminsky, J. P. Bullock, G. D. Phelan: Photophysical properties, X-ray structures, electrochemistry, and DFT computational chemistry of osmium complexes. Inorganic Chimica Acta 362 (2009) 1611-1618
113. L. S. Park-Gehrke, J. Freudenthal, W. Kaminsky, A. G. Dipasquale, J. M. Mayer: Synthesis and oxidation of Cp*Ir-III compounds: functionalization of a Cp* methyl group. DALTON TRANSACTIONS 11 (2009) 1972-1983
114. W. Kaminsky: Real-time linear-birefringence-detecting polarization microscope. April 21st 2009, **US Patent 7522278**
115. A. Dehestani, A. Wu, R. Hayoun, W. Kaminsky, J. M. Mayer: Dihydroxylation of Alkenes using a Tp-Osmium Complex. Inorganica Chimica Acta 362 (2009) 4534-4538.
116. A. Barbon, E. D. Bott, M. Brustolon, M. Fabris, B. Kahr, W. Kaminsky, P. J. Reid, S. Wong, K. L. Wustholz, R. Zanre: Triplet States of the Nonlinear Optical Chromophore DCM in Single Crystals of Potassium Hydrogen Phtalate and their Relationship to Single Molecule Dark States. JACS 131 (2009) 11548-11557.
117. K. S. Singh, W. Kaminsky, C. Rodrigus, C. G. Naik: Structural studies and antimicrobial properties of norcembrane diterpenoid from an Indian soft coral Sinularia inelegans Tixier-Durivault sp. J Chem. Sciences 121 (2009) 1041-1046.
118. B. Kahr, J. Freudenthal, S. Phillips, W. Kaminsky: Herapathite. **SCIENCE** - Brevia 324 (2009) 1407.
119. X. Deng, R. Gujjar, F. El Mazouni, W. Kaminsky, N.A. Malmquist, E.J. Gold-smith, P.K. Rathod: Structural plasticity of malaria dihydroorotate dehydro-genase allows selective binding of diverse chemical scaffolds. J Biol. Chem. 284 (2009) 26999-27009.
120. M. P. Lanci, M. S. Remy, W. Kaminsky, J. M. Mayer, M. S. Sanford: Oxidatively Induced Reductive Elimination of Ethane from PdIIMe2(4,4'-tBu2bpy) JACS 131 (2009) 15618-15620
121. J. Meredith, K. Goldberg, W. Kaminsky, D. Heinekey: Dinuclear Iridium complexes Containing Cp* & Carbonyl Ligands: Synthesis, Structure & Reactivity. Organometallics 28 (2009) 3546-51.
122. B. Carlson, B. Eichinger, W. Kaminsky, G. Phelan: Organometallic osmium & iridium complexes as phosphorescent dye in barometric sensitive coatings. Sensors & Actuators: B. 145 (2010) 278-284.
123. W. Kaminsky, S. Steininger, J. Herreros-Cedres, A.M. Glazer: Evidence of a circular polarized light mode along the optic axis in c-cut $NH_4H_2PO_4$, induced by circular differential reflection and anomalous birefringence. J Phys Condens. Matter 22 (2010) 095902
124. W. Kaminsky, D. Responte, D. Daranciang, J. Gallegos, B.-C. NgocTran, T.-A. Pham: Structure, morphology & optical properties of chiral N-(4-X-phenyl)-N-[1(S)-1-phenylethyl]thiourea, X= Cl, Br, and NO_2. Molecules 2010, 15, 554-569
125. Y. Bing, D. Selassie, R. Paradise, C. Isborn, N. Kramer, M. Sadilek, W. Kaminsky, B. Kahr: Circular Dichroism Tensor of a Triarylmethyl Propeller in Sodium Chlorate Crystals. JACS 132 (2010) 7454-7465
126. D. G. Patel, M.M. Paquette, R.A. Kopelman, O. V. Sarycheva, J. B. Benedict, W. Kaminsky, M. J. Ferguson, and N. L. Frank: A Solution- and Solid-State Investigation of Medium Effects on Charge Separation in Metastable Photomerocyanines. JACS 132 (2010) 12568-12586.
127. T. J. Hebden, A, J. St. John, D. G. Gusev, W. Kaminsky, K. I. Goldberg, D. M. Heinekey: Preparation of a Dihydrogen Complex of Cobalt. Angewandte Chemie int. ed 50 (2011) 1873-1876

128. S. D. Tran, T. A. Tronic, W. Kaminsky, D. M. Heinekey, J. M. Mayer: Metal-free carbon dioxide reduction and acidic C-H activations using a frustrated Lewis pair. Inorg. Chim. Acta 369 126-132.
129. G. Villar-Acevedo, E. Nam, S. Fitch, J. Benedict, J. Freudenthal, W. Kaminsky, J. Kovacs: Influence of Thiolate Ligands on Reductive N–O Bond Activation. Oxidative Addition of NO to a Biomimetic SOR Analogue, and its Proton-Dependent Reduction of Nitrite. JACS 133 (2011) ASAP
130. K. A. Grice, W. Kaminsky, K. I. Goldberg: C–H Activation of Benzene by Platinum(II) Complexes with Cyclometalated Phosphine Ligands. Inorganica Chimica Acta 369 (2011) 76-81.
131. R. Swartz, M Coggins, W. Kaminsky, J Kovacs: Nitrile Hydration by Thiolate– and Alkoxide–Ligated Co-NHase Analogues. Isolation of Co(III)-Amidate and Co(III)–Iminol Intermediates. JACS 133 (2011) 3954-3963.
132. A. R. O'Connor, W. Kaminsky, D. M. Heinekey, and K. I. Goldberg: Synthesis, Characterization, and Reactivity of Arene-Stabilized Rhodium Complexes. Organometallics 30 (2011) 2105-2116.
133. G. R. Fulmer, W. Kaminsky, R. A. Kemp, K. I. Goldberg: Syntheses and Characterization of Palladium Complexes with Hemilabile "PCO" Pincer Ligand. Organometallics 30 (2011) 1627-1636.
134. M. Coggins, L. Brines, S. Toledo, W. Kaminsky, J. Kovacs: Insight Into the Effect that Thiolate Ligands Have on Hydrogen Atom Transfer Reactions Promoted by Water Soluble Lipoxygenase Mimics. JACS (2011) submitted.
135. T. A. Tronic, M. Rakowski-DuBois, W. Kaminsky, M. K. Coggins, T. Lui, and J. M. Mayer: Dioxygen Activation by a Ruthenium(II) Complex Promoted by Protonation in the Second Coordination Sphere. Angewandte Chemie (submitted).
136. M. Asma, B. Carlson, A. Badshah, T. Hussain, W. Kaminsky: Correlating mixed donor ligand geometry in Palladium (II) Catalyst Precursors to Ethylene Oligomerization activity. (submitted).
137. K. S. Singh, W. Kaminsky: Synthesis, spectral and structural studies of water soluble arene ruthenium (II) complexes containing 2,2'-dipyridyl-N-alkyl imine ligand: Inorganic Chimica Acta 1 (2011) 487-491.
138. J. Freudenthal, W. Kaminsky, B. Kahr: Chiroptical imaging of crystals (Book Chapter). Advances in Chiroptics (N. Berova, P. Polavarapu, L. Nafie, eds.) Wiley VCH (in press)
139. K. S. Singh and W. Kaminsky: Isolation and X-ray structure of deoxycholic acid from the sponge Iricinia sp. Nat. Prod. Comm. (submitted)

VI. Grant Activity: (*funded*)

Agency	title	PI and Co-PI's	amount	period
PRF	Interpretation of Gyration Tensors	W. Kaminsky, Bart Kahr	$60,000 direct	2000 – 2002
RRF	Novel Microscope	W. Kaminsky	$28,000 direct	2003 – 2004
UW, OT&T	U-pol patent application	W. Kaminsky, B. Kahr	$12,000	2004
WRF (gift)	Millipol Prism	W. Kaminsky	$22,000 direct	2005
NSF (GOLI)	Stochastic Behavior in Polymer optical Fiber Drawing	A. Emery A. Mescher, P. Nollert, (W.K)	$360,000	2007 – 2009
NSF (GOLI) extension	Stochastic Behavior in Polymer optical Fiber Drawing	A. Emery A. Mescher, P. Nollert, (W.K.)	$120,000	2009 – 2010
Center for Commercialization	License of Millipol Technology, Patent application, and consultancy	W. Kaminsky	$100,000 ca., so far	2006 –
RRF	HAUP-Microscope	W. Kaminsky	$26,000 direct	2007 – 2009
PRF	Beyond specific rotations	B. Kahr, W. Kaminsky	$100,000 direct	2008 – 2009

VII. Honors and Awards:

DFG Habilitation Award (1994, $60,000), April 2006: WinXMorph: WebPage of the week, ParallelGraphics VRML Browser provider

VIII. Additional Comments on Research, Teaching, and Service:

I have been running the X-ray lab of the Department since 2000 with up to 120 publishable structures per year.

8 Inventions were disclosed to the UW Center for Commercialization. I made it on the top 10 list of the University of Washington's most innovative scientists in 2004. 3 Patent Applications were filed, 2 obtained. 1 Invention was licensed to local company Emerald Biosystems for 5 years. 3 Educational Software Packages, 'WinXMorph', 'WinTensor', and 'REMSEM' have been licensed through the UW Center for Commercialization to over 1000 customers.

Faculty council work included discussions to prevent plagiarism and in passing a legislation (Class C Bulletin No. 477) for proper handling of Life Webcams.

Summary of Selected Professional Activities

Name: Niels H. Andersen — Date of Revised Vitae: 6/11
Rank: Professor — Date of Ph.D.: 1966 — Date of UW hire: 1968 — Date of last promotion: 1976

I. Courses Taught (2000 - present):

CHEM 221 (1), CHEM 223 (5), CHEM 224 (3). CHEM 237 (8), CHEM 238 (5), CHEM 242 (2) CHEM 460 (1), CHEM 463 (2), CHEM 502 (2), and CHEM 530 (4).

II. Department and University Service:

Departmental Committees:

Academic Personnel (1995-2011), Safety (2001-07), Graduate Advising/Orientation (1996-99, 2004-07), Research Services (2000-02, 2008), Space (2003-06), Organic Faculty Search (2003-10)

College and University Committees:

Faculty Senate (1997-2001, 2009-11), Faculty Senate Executive Committee (1999-2000), Pharmacy School Dean Review (2001), Royalty Research Fund Review Comm. (2001-03), Biophysics Training Grant Selection Comm. (1999, 2000, 2002), BMSD Steering Comm. (2002-09)

[ ] Total Other Graduate Supervisory Committees: (does not include students in own group)

III. Research Group (current):

[2]	graduate students	[1]	Postdoctoral associate	[43]	Ph.D.s granted (career total)
[1]	undergraduate students	[1]	Other, Visiting Scientist	29	Post-doctorals (1972 →)

IV. Invited Lectures: career total [~220]

"Protein Folding: Explorations in the Peptide/Protein Borderlands" and related miniprotein and folding titles
4/00 tour: U. Penn. (Biochem. & Biophys.), Bristol-Myers Squibb, U. Kentucky (Chem.), U. Louisville (Chem.); 9/00 tour: 26th European Peptide Symposium (Montpellier, France), U. Barcelona (Quimica Organica), University of Padova, CSIC (Madrid, Spain); Cal. Tech. (2/01), UC San Diego (3/01), 17th American Peptide Symposium (6/01, San Diego, CA), EMBL (Heidelberg, Germany, 9/01), 3rd International Workshop on Structural Characterization of Proteins (San Vito di Cadore, Italy, 9/01), 4th Australian Peptide Symposium (10/01, Lindeman Is., Australia), Arizona State U. (2/02), SUNY Stony Brook (11/02), U. Florida (Structural Biology, 5/03), Taichung Nat'l. University (Taiwan, 1/05), 19th American Peptide Symposium (San Diego, 6/05).

"LpxC Inhibitors, A New Class of Antibacterial Agents Against Gram Negative Pathogens" and other drug discovery related titles
Bristol-Myers Squibb (11/00), Amylin Pharmaceutical (2/01), Bioactive Peptides Conference (Capri, 5/04), ICAAC Symposium (Washington DC 11/04), Pfizer (Ann Arbor, MI 11/04), UW BMSD Program (1/05), Wellstadt Therapeutics (2/05), UW BMSD Program (1/05), BioVeris (2/05), Wellstadt Therapeutics (MD, 5/06), Achaogen Inc. (11/06, So. San Francisco, CA)

"Chemical Shifts, the Ultimate Test of Polypeptide Structural and Dynamics Models" and related titles
University of Arizona (2/02), 27th European Peptide Symposium (Sorrento, Italy, 9/02), WWU (Bellingham WA, 2/03), LNLS Symposium (Sao Paulo, BR 2/04), 4th International Workshop on Structural Characterization of Proteins (San Vito di Cadore, Italy, 5/04), International High Field NMR Symposium (Chinese Academy of Science, Taipei, Taiwan 1/05). U. Padova (Italy, 4/06).

"NMR Characterization of Peptide/Protein Structure and Dynamics" (2 day workshop)
Sao Paulo (Brazil, 2/04), Korean Institute of Science (7/06)

"Miniprotein/Peptide Folding Dynamics Derived by NMR Spectroscopy" and related titles
5th Int'l. Sympos. Struc. of Proteins (Italy, 6/06), Joint Korea/Japan NMR Symp. (JeJu Is., Korea 7/06), TIDEs (5/09).

"Amyloidogenesis Inhibition by Designed β Hairpins"
European Peptide Symposium (Helsinki 2008, Copenhagen 2010).

V. Publications: career total [202] in press [0] submitted [2] book chapters, reviews [7]

Selected Publications

Total Synthesis of Prostaglandins. Synthesis of the Pure *d,l*-E_1, $F_1\alpha$, $F_1\beta$, A_1, and B_1 Hormones, E.J. Corey, N.H. Andersen, R.M. Carlson, J. Paust, E.Vedejs, I. Vlattas, and E.K. Winter, J. Am. Chem. Soc. **90**, 3245-47 (1968).

Chemical Simulation of the Biogenesis of Cedrene, N.H. Andersen and D.D. Syrdal, *Tetrahedron Letters,* 2455-58 (1972).

Metal Ion Probes of Molecular Geometry. II. A Direct Spectroscopic Determination of the Absolute Configuration of Hydroxyl Bearing Asymmetric Centers Based on the Shift Reagent, $Eu(FOD)_3$, N.H. Andersen, B.J. Bottino, A. Moore, and J.R. Shaw, *J. Amer. Chem. Soc.* **96**, 603-605 (1974).

Optical Activity Associated with Isolated Olefinic Bonds. II. Experimental Evidence for the Role of π Bond Torsion in CD Couplets; and the Question of the $\sigma \rightarrow \pi^*$ Contribution, N.H. Andersen, C.R. Costin, and J.R. Shaw, *J. Amer. Chem. Soc.* **96**, 3692-93 (1974).

Regarding the Mechanism of C-H Bond Acidification by Sulfur, W.T. Borden, E.R. Davidson, N.H. Andersen, A.D. Denniston and N.D. Epiotis, *J. Amer. Chem. Soc*. **100**, 1604-6 (1978).

500 MHz Proton NMR Studies of the Medium-dependent Conformational Preferences of Prostaglandin $F_2\alpha$ Analogs, N.H. Andersen and B.-S. Lin, *Biochemistry* **24**, 2238 (1985).

Nuclear Magnetic Resonance Studies of Aminoglycoside Antibiotics. Relayed Coherence Transfer for Resonance Assignment and in Situ Structure Elucidation of Amikacin Hapenization Reaction Mixtures. N.H. Andersen, H.L. Eaton, K.T. Nguyen, C.J. Hartzell, J.H. Priest, R.J. Nelson, *Biochemistry*, **27**, 2782-2790 (1988).

Conformational Isomerism of Endothelin in Acidic Aqueous Media: A Quantitative NOESY Analysis, N.H. Andersen, C. Chen, T.M. Marschner, S.R. Krystek and D. Bassolino *Biochemistry*, **31**, 1280-1295 (1992).

Hevein: The NMR Assignment and an Assessment of Solution-state Folding for the Agglutinin-Toxin Motif, N. H. Andersen, B. Cao, A. Rodriguez and B. Arreguin, *Biochemistry*, **32**, 1407-1422 (1993).

Structural and Dynamic Properties of a β Hairpin-Forming Linear Peptide. I. Modeling Using Ensemble-Averaged Constraints, K. L. Constantine, L. Mueller, N. H. Andersen, H. Tong, C. F. Wandler, M. S. Friedrichs, and R. E. Bruccoleri, *J. Am. Chem. Soc.*, **117**, 10841-10854 (1995).

Cold Denaturation of Monomeric Peptide Helices, N. H. Andersen, J. Cort, Z. Liu, S. Sjoberg and H. Tong, *J. Am. Chem. Soc.*, **118**, 10309-10310 (1996).

Extracting Information from the Temperature Gradients of Polypeptide NH Chemical Shifts: I. The Importance of Conformational Averaging, N. H. Andersen, J. W. Neidigh, S. M. Harris, C. Chen, G. M. Lee, Z. Liu, and H. Tong, *J. Am. Chem. Soc.*, **119**, 8547-8561 (1997).

Empirical Parameterization of a Model for Predicting Peptide Helix/Coil Equilibrium Populations, N. H. Andersen & H. Tong, *Protein Sci.*, **6**, 1920-1936 (1997).

Effect of Hexafluoroisopropanol on the Thermodynamics of Peptide Secondary Structure Formation, N. H. Andersen, R. B. Dyer, R. M. Fesinmeyer, F. Gai, Z. Liu, J. W. Neidigh, & H. Tong, *J. Am. Chem. Soc,* **121**, 9879-9880 (1999).

Exendin-4 and Glucagon-like-peptide 1: NMR Structural Comparisons in the Solution and Micelle-Associated States, J. W. Neidigh, R. M. Fesinmeyer, K. S. Prickett & N. H. Andersen, *Biochemistry*, **40**, 13188-13200 (2001).

Medium-Dependence of the Secondary Structure of Exendin-4 and Glucagon-Like-Peptide-1, N. H. Andersen, Y. Brodsky, J. W. Neidigh & K. Prickett, *Bioorganic & Medicinal Chemistry*, **10**, 79-85 (2002).

Dynamics of the Primary Processes of Protein Folding: Helix Nucleation, J. H. Werner, R. B. Dyer, R. M. Fesinmeyer & N.H. Andersen, *J. Phys. Chem. B*, **106**, 487-494 (2002).

Designing a 20-Residue Protein, J.W. Neidigh, R.M. Fesinmeyer & N.H. Andersen, *Nature Struct. Biol.*, **9**, 425-430 (2002). [See also: *Nature Struct. Biol.*, **9**, 408-410; *JACS*, **124**, 11258-11259, 12952-12953 & 14548-14549 (2002).]

Activation of Erythropoietin Receptor through a Novel Extracellular Activation Site, T. Naranda, R.I. Kaufman, J. Li, K. Wong, A. Boge, D. Hallen, K.Y.C. Fung, M.W. Duncan, N. Andersen, A. Goldstein & L. Olsson, *J. Endocrinology*, 143, 2293-2302 (2002).

Determinants of Miniprotein Stability: Can anything replace a buried H-bonded Trp sidechain, Bipasha Barua & N. H. Andersen, *Letters in Peptide Science*, **8**, 221-226 (2002).

Potent, Novel *in vitro* Inhibitors of the *Pseudomonas aeruginosa* Deacetylase LpxC, T. Kline, N. H. Andersen, E. A. Harwood, J. Bowman, A. Malanda, S. Endsley, A. L. Erwin, M. Doyle, S. Fong, A. L. Harris, B. Mendelsohn, K. Mdluli, C. R. H. Raetz, C. K. Stover, P. R. Witte, A. Yabannavar & S. Zhu, *J. Med. Chem.*, **45**, 3112-3129 (2002).

Peptide Conformational Changes Induced by Tryptophan-Phosphocholine Interactions in a Micelle, J. W. Neidigh & N. H. Andersen, *Biopolymers*, **65** , 354-361 (2002).

^{19}F NMR Studies of Tryptophan/Serum Albumin Binding, B. Cao, S. Endsley & N. H. Andersen, *Bioorganic & Medicinal Chemistry*, **11**, 69-75 (2003).

Possible Locally-Driven Folding Pathways of TC5b, A 20-Residue Protein, G. V. Nikiforovich, N. H. Andersen & R. M. Fesinmeyer & C. Frieden, *Proteins*, **52**, 292-302 (2003).

A Low Barrier Hydrogen Bond Between Histidine of a Secreted Phospholipase A_2 and a Transition State Inhibitor, M. J. Poi, J. W. Tomaszewski, C. Yuan, C. A. Dunlap, N. H. Andersen, M. H. Gelb & M-D. Tsai, *J. Mol. Biol.*, **329**, 997-1009 (2003).

Enhanced Hairpin Stability through Loop Design, the Case of the Protein G B1 Domain Hairpin, R. M. Fesinmeyer, F. M. Hudson & N. H. Andersen, *J. Am. Chem. Soc.*, **126**, 7238-7243 (published on line 5/22/04).

The Mechanism of β Hairpin Formation, R. B. Dyer, S. J. Maness, E. S. Peterson, S. Franzen, R. M. Fesinmeyer & N. H. Andersen, *Biochemistry*, **43**, 11560-11566 (published on line 8/19/2004).

Exenatide: NMR/CD Evaluation of the Medium Dependence of Conformation and Aggregation State, F. Michael Hudson & Niels H. Andersen, *Biopolymers (Peptide Science)*, **76**, 298-308 (2004).

The Helical Alanine Controversy: An $(Ala)_6$ Insertion Dramatically Increases Helicity, J. C. Lin, B. Barua & N. H. Andersen, *J. Am. Chem. Soc.*, **126**, 13679-13684 (2004).

Hairpin Folding Dynamics: The Cold-denatured State is Predisposed for Rapid Refolding, R. B. Dyer, S. J. Maness, S. Franzen, R. M. Fesinmeyer, K. A. Olsen & N. H. Andersen, *Biochemistry*, **44**, 10406-10415 (2005).

Studies of Helix Fraying and Solvation Using ^{13}C' Isotopomers, R. M. Fesinmeyer, E. S. Peterson, R. B. Dyer & N. H. Andersen, *Protein Sci.*, **14**, 2324-2332 (2005).

Hairpin folding rates reflect mutations within and remote from the turn region, K. A. Olsen, R. M. Fesinmeyer, J. Stewart & N. H. Andersen, *Proc. Natl. Acad. Sci. USA*, **102**, 15483-15487 (2005).

Chemical Shifts Provide Fold Populations and Register of β-Hairpins and β-Sheets, R. M. Fesinmeyer, F. M. Hudson, K. A. Olsen, G. W. N. White, A. Euser & N. H. Andersen, *J. Biomolecular NMR*, **33**, 213-231 (2005).

Minimization and Optimization of Designed β Hairpin Folds, N. H. Andersen, K. A. Olsen, R. M. Fesinmeyer, X. Tan, F. M. Hudson, L. A. Eidenschink & S. R. Farazi, *J. Am. Chem. Soc.*, **128**, 6101-6110 (2006).

Measuring Cooperativity in the Formation of a Three-Stranded β Sheet (Double Hairpin), F. M. Hudson & N. H. Andersen, *Biopolymers*, **83**, 424-3 (2006).

A pre-existing hydrophobic collapse in the unfolded state of an ultrafast folding protein, K. H. Mok, L. T. Kuhn, M. Goez, I. J. Day, J. C. Lin, N. H. Andersen & P. J. Hore, *Nature*, **447**, 106-109 (2007).

The Trp-cage: Optimizing the Stability of a Globular Miniprotein, B. Barua, J. C. Lin, D. V. Williams, J. W. Neidigh, P. Kummler & N. H. Andersen, *Protein Engineering Design and Selection*, **21**, 171-185 (2008).

Structural insights for designed alanine-rich helices: Comparing NMR helicity measures and conformational ensembles from MD, K. Song, J. Stewart, R. M. Fesinmeyer, N. H. Andersen & C. Simmerling, *Biopolymers*, **89**, 747-760 (2008).

"Antibacterial Agents", United State Patent # US 7,358,359 B2, N. H. Andersen & J. Bowman, 489 pp., April 15, 2008.

Lysine and arginine residues do not increase the helicity of alanine-rich peptide helices, J. M. Stewart, J. C. Lin & N. H. Andersen, *Chem. Commun.*, 4765-4767 (2008) DOI:10.1039/b807101b.

Probing the Lower Size Limit for Protein-like Fold Stability: Ten-residue Microproteins with Specific, Rigid Structures in Water, B. L. Kier & N. H. Andersen, *J Am Chem. Soc.*, **130**, 14675-14683 (2008). DOI: 10.1021/ja804656h.

Hyperstable Miniproteins: Additive Effects of D- and L-Ala Mutations, D. V. Williams, B. Barua, N. H. Andersen, *Organic & Biomolecular Chemistry*, **6**, 4287-4289 (2008).

Very Short Peptides with Stable Folds: Building on the Inter-relationship of Trp/Trp, Trp/cation, and Trp/backbone-amide Interaction Geometries, L. A. Eidenschink, B. L. Kier, K. Huggins & N. H. Andersen, *Proteins: Structure, Function & Bioinformatics*, **75**, 308-322 (2009).

Development of Calcitonin Salmon Nasal Spray: Similarity of peptide formulated in chlorobutanol compared to benzalkonium chloride as preservative, H. R. Costantino, *et al.* (L. A. Eidenschink & N. H. Andersen as UW authors), *J. Pharmaceutical Sciences*, **98**, 3691-3706 (2009).

Terminal side-chain packing of a designed β-hairpin influences its conformation and stability, L. Eidenschink, E. Crabbe & N. H. Andersen, *Biopolymers*, **91**, 557-564 (2009).

Solution-state Structures of Human Pancreatic Amylin and Pramlintide, J. R. Cort, Z. Liu, G. M. Lee, K. N. L. Huggins, S. Janes, K. Prickett & N. H. Andersen, *Protein Engineering Design and Selection*, **22**, 497-513 (2009).

Hairpin Peptide Inhibitors of Amyloid Fibril Formation, K. N. L. Huggins & N. H. Andersen, in *Chemistry of Peptides in Life Science, Technology and Medicine* (Lankinen, H., Ed.) (*30th EPS, Helsinki)*, pp. 590-591 (2010).

Stabilizing Capping Motif for β Hairpins and Sheets, B. L. Kier, I. Shu, L. A. Eidenschink & N. H. Andersen, *Proc. Natl. Acad. Sci. USA*, **107**, 10466-10471 (2010).

Designed Hairpins Modulate the Amyloidogenesis of α Synuclein: Oligomerization Inhibition and Diversion to Non-amyloid Aggregates, N. H. Andersen, K. N. L. Huggins, M. Bisaglia & L. Bubacco, *31st EPS Symp. Vol.*, 22-23 (2010) – a paper from the invited talk.

β-Sheet ^{13}C Structuring Shifts Appear only at the H-bonded Sites of Hairpins, I. Shu, J. M. Stewart, M. Scian, B. L. Kier & N. H. Andersen, *J. Am. Chem. Soc.*, **133**, 1196-1199 (2011).

Concerning the Optimal Salt Bridge for Trp-cage Stabilization, D. V. Williams, A. Byrne, J. M. Stewart & N. H. Andersen, *Biochemistry*, **50**, 1143-1152 (2011).

Designed Hairpin Peptides Interfere with Amyloidogenesis Pathways: Fibril Formation and Cytotoxicity Inhibition, Interception of the Preamyloid State, K. N. L. Huggins, M. Bisaglia & L. Bubacco, M. Tatarek-Nossol, A. Kapurniotu & N. H. Andersen, *Biochemistry*, reviewed (accept after revision, revision in progress).

Circular Permutation of the Trp-cage Folding Motif, N. H. Andersen, B. L. Kier, M. Scian & Jasper Lin, *Angew. Chemie Int. Ed. Engl.*, submitted.

VI. Grant Activity:

9/97-8/99	Upgrade of UW Chemistry Dept. NMR Facility	NSF (Chem. Instrum.)	$212,000
7/98-6/00	MiniProtein Design and Folding Thermodynamics	UW Royalty Research Fund	$30,234
7/97-8/00	Information from NH Chemical Shift Temperature Gradients	ACS-PRF	$50,000
7/99-11/01	Engineering Better Leptins	Diabetes/Endocrinology Research Center	$68,000
5/97-12/01, 1/03-12/04	Exendin/GLP Structural Studies (3 grants)	Amylin Pharmaceuticals	$128,690
9/98-9/02	Cytokine Receptor Fragments	Receptron, Inc.	$43,200
11/99-3/02	Inhibitors of LpxC	Cystic Fibrosis Foundation	$587,272
4/00-3/05	Thermodynamics and the Design of Structured Peptides	NIH GM59658 (01-04)	$721,394
3/02-9/04	Optimization of LpxC Inhibitors	Chiron Corporation	$327,977
7/03-6/06	Peptide Secondary Structure: Folding .Optimization	NSF CHE # 0315361	$390,000
	600 MHz Cryoprobe NMR (joint with Klevit & Varani)	NIH 1 S10 RR19133	$500,000
7/04-6/07	NSF NMR Equip Grant	(DBI 0439063, N. Andersen as P.I.)	$400,000
4/05-3/10	Miniproteins: Folding Equilibria, Pathways and Rates	NIH GM059658 (05-09)	$1,095,850
3/07-2/11	Peptide Secondary Structure	NSF CHE #0650318	$408,000
2/09-1/10	"Substrate Based Proteolytic Inhibitors for the Treatment of Huntington's Disease"		
	NIH SBIR phase I, joint with Icogenex	(UW portion)	$108,820
7/09-3/11	ARRA Supplement to NIH GM059658	3R01 GM059658-08S1	$124,700
Pending			
10/11-9/14	"Exploring Protein Folding Landscapes by Circular Permutation"		
	NIH GM099889	(6/11 review: priority 19, percentile = 10.0)	$1,369,046

VII. Honors, Awards, other Professional Services:

Alfred P. Sloan Research Fellow (9/72-8/74), Dreyfus Teacher Scholar Award (10/74-9/79), NIH Career Development Award (GM00134, 6/75-5/80), U.S.-Italy Working Group on Training in Prostaglandin Research (1/79-6/82)

2000 forward

NSF Major Research Instrumentation Review Committees (1998, 2007), BNP Study Section, NIH [6/00, 6/03, 3/04], SBCB Study Section (2006, 2007), SRG 2011 ZRG1 BCMB-D IRG (2011), Advisory Board of *Biopolymers* (1/02-presesnt), Session Organizer 1st Protein Folding Dynamics GRC (Ventura CA, 1/02), NIH Site Visit for Marine & Freshwater Biomed. Sci. Center (Oregon State U., 5/03), Short Course in Polypeptide NMR (Campinas, Brazil, 2/04); Plenary Lectures: Structural Characterization of Proteins (San Vito di Cadore, Italy, 5/04), High Field NMR Symposium (Chinese Academy of Science, Taipei, Taiwan 1/05). NCCDG Review (2004), NIAID Therapeutic Agents contract review (2010), NHLBI SMARTT Program contract review (2010).

VIII. Additional Comments on Research, Teaching, and Service:

The inhibitors of LpxC (major component of the outer membrane of gram negative bacteria) synthesis designed in my laboratory have been patented and the UW rights have been licensed by a pharmaceutical company. The development of these antibiotic leads is well along toward clinical trials and has been providing some royalties to support my research and the UW Royalty Research Program.

Summary of Selected Professional Activities

Name: **Charles T. Campbell** Date of Revised Vitae: **6/2011**
Rank: **Professor** Date of PhD: **1979** Date of UW hire: **1989** Date of last promotion: **1992**

I. Courses Taught *(No. of times taught: Adjusted medians of 1st 4 items on Student Evaluations, with 5 = best)*
CHEM 552 (3 times: 4.1, 4.8, 4.8, 15-20 students in this class); CHEM 142 (3 times: 3.5, 3.8, 3.8, 500-550 students in this class). (I was on sabbatical in 2009-10.)

II. Department and University Service:

University Committees: Provost's Molecular Engineering Working Group, Chair of its Building Committee, and on its Vision Committee (2006-07). Successfully secured ~$70M from State of Washington for building construction.
Provost's Programming and Building Committee for the Molecular Engineering Building Project (2007-09).
Condensed Matter Physics/Biophysics Faculty Search Committee (2008).
Bioresource Engineering Professorship Search Committee (2009-10).
Chemistry Dept. Committees: Academic Personnel (1993-present); Chair's Advisory Committee (1996-09); Faculty Search Committee: nearly every year.

21 **Total Other Graduate Supervisory Committees**: (does not include students in own group) since 2007

III. Research Group (current):

7	graduate students	1	Postdoctoral associates	21	Ph.D.s granted (career total)
2	undergraduate students	0	other Visiting Faculty		

***IV. Invited Lectures*:** career total 249

Since 2007 only:
Invited Talks at Scientific Conferences:

94. Gordon Research Conference: Chemical Reactions at Surfaces, Ventura, CA, Feb. 11-16, 2007.
95. Physical Electronics Conference, Urbana, IL, June 19-22, 2007.
96. Pacific Coast Catalysis Society, Pasedena, CA, Nov. 2, 2007.
97. Annual Meeting of the German Physical Society, Berlin, Feb. 25-29, 2008.
98. ACS National Meeting, New Orleans, Apr. 6-10, 2008.
99. 6th Congress of the International Society for Theoretical Chemical Physics, Vancouver, BC, July 19-24, 2008.
100. 25 Years of Biointerface Science Symposium, University of Washington, Seattle, Aug. 24-7, 2008.
101. ACS National Meeting, Philadelphia, Aug. 17-21, 2008.
102. International Symposium on Surface Science and Nanotechnology (ISSS-5), Tokyo, Japan, Nov. 9-13, 2008.
103. Catalysis Club of Chicago Lecture, Dec. 1, 2008.
104. Michigan Catalysis Society Monthly Meeting, Dec. 9, 2008.
105. ACS National Meeting, Symposium on Convergence of Theory with Experiment in Surface Chemistry, Salt Lake City, Mar. 22-26, 2009.
106. ACS National Meeting, Olah Award Symposium, Salt Lake City, March 22-26, 2009.
107. Interdisciplinary Surface Science Conference, Reading, UK, March 30-April 2, 2009.
108. North American Meeting of the Catalysis Society, Plenary Lecture, San Francisco, June 7-12, 2009.
109. Taylor Conference on Heterogeneous Catalysis, Plenary Lecture, Cardiff Univ., UK, June 22-25, 2009.
110. ACS National Meeting, Fuel Division (Separations & Catalysis Needs for Renewable Energy Symposium), San Francisco, March 21-25, 2010.
111. ACS National Mtg, Catalysis Directorate (Madix/Stair Awards Symposium), San Francisco, Mar. 21-25, 2010.
112. Gordon Research Conference on Catalysis, Colby Sawyer College, NH, June 27 – July 2, 2010.
113. 6th Tokyo Conference on Advanced Catalytic Science and 5th Asian Pacific Congress on Catalysis, Sapporo, Japan, July 18-23, 2010.
114. ACS National Meeting, Petroleum Division (Symposium Honoring Henrik Topsoe's Award), Boston, Aug. 22-26, 2010.
115. AVS National Meeting, Albuquerque, NM, Oct. 17-22, 2010.
116. ACS National Meeting, Petroleum Division Symposium Honoring Jeffery Bricker (Senior Director of Research, UOP) for his ACS Award for Creative Invention), Anaheim, Mar. 27-31, 2011.
117. ACS National Meeting, Fuel Division, Symposium on Nanomaterials and Nanotechnology in Fuels and energy Production, Anaheim, Mar. 27-31, 2011.
118. Catalysis Club of Chicago Spring Symposium, Naperville, IL, May 19, 2011.

FUTURE:

119. Faraday Discussion on Gold Catalysis, Cardiff University, UK, July 4-6, 2011.
120. ACS National Meeting, Surface Science for Catalysis Symposium, Denver, Aug. 28-Sept. 1, 2011. (presented by graduate student Eric Karp)
121. Europacat X, Glasgow, Scotland, August 28-Sept. 2, 2011.
122. American Physical Society (APS) March 2012 National Meeting symposium on Chemical Physics for New Energy, Boston, February 27-March 2, 2012.
123. ACS National Meeting, Physical Chemistry Div. Symposium on Frontiers of Catalysis, San Diego, Mar. 25-29, 2012.

University and Industrial Seminars

110. Reilly Lectureship, University of Notre Dame, 2007.
111. University of Buffalo, Chemistry Dept., May 22, 2007.
112. Beijing University, China, June 23, 2008
113. Dalian University, China, June 25, 2008
114. USTC, Hefei, China, June 26, 2008
115. Texas A&M University, Chemistry Department, April 22, 2009.
116. University of South Carolina, H. Willard Davis Lecture, Chemistry Dept., April 24, 2009.
117. Materials Science and Engineering Dept., Univ. of Washington, Oct. 12, 2009.
118. Lawrence Berkeley Lab, Materials Sciences Div., Surface Science Seminar, Nov. 12, 2009.
119. University of California at Irvine, Chemistry Dept., Feb. 23, 2010.
120. University of Wisconsin- Madison, Chemical Engineering Dept., March 16, 2010.
121. Sandia National Lab, Physical, Chemical, and Nano Sciences Center, June 24, 2010.
122. UCLA Chemistry Department, Physical Division, Sept. 27, 2010.
123. University of Florida Chemistry Department, Nov. 23, 2010.
124. Stanford University, Jan. 11, 2011.
125. Aarhus University, Interdisciplinary Nanoscience Center (iNANO), Denmark, May 3, 2011.
126. Ipatieff Lectureship, Northwestern University, May 23, 2011.

***V. Publications*: career total** 257 **in press** 4 **submitted** 3 **book chapters, reviews** 10

Hirsch h-Index = 60, with over 800 citations per year for each of past 3 years, and 12,000 total citations.

239. SPR Imaging for high-throughput, label-free interaction analysis, C. Lausted, Z. Y. Hu, L. Hood, and C. T. Campbell, Combinatorial Chemistry and High-Throughput Screening, 12(8), 741-51 (2009).
240. Experimental measurements of the energetics of surface reactions, C. T. Campbell and O. Lytken, Surface Science 603, 1365-1372 (2009) (invited paper for special issue in honor of Ertl's Nobel Prize).
241. Defect Sites and their distributions on MgO(100) by Li and Ca adsorption calorimetry, J. A. Farmer, C. T Campbell, L. Xu, and G. Henkelman, Journal of the American Chemical Society 131, 3098-3103 (2009).
242. The degree of rate control: how much the energies of intermediates and transition states control rates, C. Stegelmann, A. Andreasen, C. T. Campbell, Journal of the American Chemical Society 131, 8077-82 (2009) (Cover Article, highlighted in Science and web page of Nature Chemistry).
243. Simultaneous MS-IR studies of surface formate reactivity under methanol synthesis conditions on Cu/SiO_2, Y. Yang, C. Mims, R. Disselkamp, C. H. F. Peden and C. T. Campbell, Topics in Catalysis 52, 1440-47 (2009).
244. Lithium Adsorption on MgO(100): Calorimetric Energies and Structure, J. A. Farmer, N. Ruzycki, J. F. Zhu and C. T. Campbell, Physical Review B 80, art. no. 035418 (2009), 8 pages.
245. Formation of the calcium/poly(3-hexylthiophene) interface: structure and energetics, J. Zhu, F. Bebensee, W. Hieringer, W. Zhao, J. H. Baricuatro, J. A. Farmer, Y. Bai, H-P. Steinrück, J. M. Gottfried and C. T. Campbell, Journal of the American Chemical Society 131, 13498-507 (2009).
246. Improved pyroelectric detectors for single crystal adsorption calorimetry from 100 to 350 K, W. Lew, O. Lytken, J. A. Farmer, M. C. Crowe, and C.T. Campbell, Review of Scientific Instruments 81, Art. No. 024102 (2010) 9 pages.
248. Interface Formation between calcium and electron-irradiated poly(3-hexylthiophene), F. Bebensee, J. Zhu, J. H. Baricuatro, J. A. Farmer, Y. Bai, H-P. Steinrück, C. T. Campbell and J. M. Gottfried, Langmuir 26, 9632-39 (2010).
249. Particle size dependent heats of adsorption of CO on supported Pd nanoparticles as measured with a single crystal microcalorimeter, J. H. Fischer-Wolfarth, J. A. Farmer, J. M. Flores-Camacho, A. Genest, I. V. Yudanov, N. Rösch, C. T. Campbell, S. Schauermann and H. J. Freund, Phys. Rev. B (Rapid Communication) 81, 241416(R) (2010), 4 pages.

250. A sinter-resistant catalytic system based on Pt nanoparticles supported on TiO_2 nanofibers and covered by porous silica, Y. Dai, B. Lim, Y. Yang, C. M. Cobley, W. Li, E. C. Cho, B. Grayson, P. T. Fanson, C. T. Campbell, Y. Sun and Y. Xia, Angewante Chemie 49, 8165-8 (2010).
251. Ag Adsorption on Reduced CeO_2(111) Thin Films, J. A. Farmer, J. H. Baricuatro and C. T. Campbell, J. Physical Chemistry C (invited for D. W. Goodman issue) 114, 17166–72 (2010).
252. Ceria Maintains Smaller Metal Catalyst Particles by Strong Metal - Support Bonding, J. A. Farmer and C. T. Campbell, Science 329, 933-936 (2010).
253. The (non) formation of methanol by direct hydrogenation of formate on copper catalysts, Y. Yang, C.A. Mims, R.S. Disselkamp, J-H. Kwak, C.H.F. Peden and C.T. Campbell, J. Phys. Chem. C 114, 17205-11 (2010).
254. Towards Well-Defined Metal-Polymer Interfaces: Temperature-Controlled Suppression of Subsurface Diffusion and Reaction at the Ca/P3HT Interface, F. Bebensee, M. Schmid, H-P. Steinruck, C. T. Campbell, J. M. Gottfried, J. Am. Chem. Soc. (Communication), 132, 12163-5 (2010).
255. Kinetics of Leucine-Lysine Peptide Adsorption and Desorption at –CH3 and –COOH Terminated Alkylthiolate Monolayers, J. S. Apte, L. J. Gamble, D. G. Castner and C. T. Campbell, Biointerphases 5, 97-104 (2010).
256. Surface chemistry: Key to control and advance myriad technologies, J. T. Yates Jr. and C. T. Campbell, Proc. Nat. Acad. of Sciences 108, 911-916 (2011).
257. Growth, structure and stability of Ag on CeO_2(111): synchrotron radiation photoemission studies, D. Kong, G. Wang, Y. Pan, S. Hu, J. Hou, H. Pan, C. T. Campbell and J. Zhu, J. Phys. Chem. C 115, 6715-6725 (2011).

***VI. Grant Activity*: (since 2007 only)**

Period	Title	Source	Total Costs
Past			
7/1/03-6/30/08	Engineered Biomaterials Training Grant (B. Ratner = PI)	NIH	$177,000/year *(shared w/ 12 faculty)*
3/15/05-3/14/08	Oxide-Supported Metal Nanoparticles: Catalytic Properties and Energetics	DOE-BES Chem. Sciences Div.	$480,000 *(Total Direct+Indirect)*
5/1/05-4/30/08	Adsorption Energetics on Well-Defined Surfaces by Microcalorimetry	NSF	$500,000 *(Total Direct+Indirect)*
7/16/07-6/15/08	SPR Microscopy for High-Throughput Analyses	Plexera Corp.	$50,000
6/1/08-5/31/10	Adsorption Energetics on Well-Defined Surfaces by Microcalorimetry	NSF (2-year Special Creativity Award)	$410,000
3/15/08-3/14/11	Oxide-Supported Metal Nanoparticles: Catalytic Properties and Energetics….	DOE-BES Chem. Sciences Div.	$600,000
Current			
3/1/09-2/28/11	Sinter-Resistant Catalysts for Automotive Exhaust Applications.	Toyota USA	$150,000
9/1/10-8/31/13	Adsorption Energetics on Well-Defined Surfaces by Microcalorimetry	NSF	$682,081
3/15/08-3/14/11	Supported Metal Nanoparticles: Correlating Catalytic Kinetics, Energetics and Surface Structure.	DOE-BES Chem. Sciences Div.	$605,000
4/1/11-12/31/11	Studies of Organic - Inorganic Coating Interfaces	Boeing Company	$49,129

***VII. Honors and Awards*:**

Elected Fellow of the American Association for the Advancement of Science (2010)
Ipatieff Lectureship (2010-11), Northwestern University
H. Willard Davis Lecture, Chemistry Dept., University of North Carolina, April 24, 2009
American Chemical Society Arthur W. Adamson Award for Distinguished Service in the Advancement of Surface Chemistry (2007)
Paul B. Hopkins Faculty Award, Department of Chemistry, University of Washington (2006-07)
Reilly Lectureship, University of Notre Dame (2007)
University Lectureship, University of Ottawa, Department of Chemistry, Oct. 14, 2005
University Lectureship, University of Washington, Dept. of Chemistry, Oct. 27, 2005
Lloyd E. and Florence M. West Endowed Professorship in Chemistry (2004-present)
Alexander von Humboldt Research Award (2003)
American Chemical Society Award in Colloid or Surface Chemistry (2001)

St. John's College, Cambridge University, England, Overseas Visiting Scholar Fellowship (1996)
John Yarwood Memorial Award of the British Vacuum Council (1989)
Camille and Henry Dreyfus Foundation Camille Dreyfus Teacher-Scholar Award (1988-92)

***VIII. Additional Comments on Research, Teaching, and Service*:**

MAJOR AWARDS OF FORMER GRADUATE STUDENTS:

Jason Farmer (PhD 2010) won Best Dissertation from the University of Washington for 2010 from all areas of mathematics, physical sciences and engineering, and was the University's nominee for the Council of Graduate Schools Distinguished Dissertation Award national competition.

Jennifer Shumaker-Parry (PhD 2002) won an NSF CAREER Award.

Jose Rodriguez (PhD 1988) won the 2007 National HENAAC Outstanding Technical Achievement Award for Hispanic scientists and engineers.

EDITORIAL POSITIONS:

Editor-in-Chief of the journal *Surface Science* (2002-present)

Guest Co-Editor with John Yates: *Proceedings of the National Academy of Science*, Feature Issue on Surface Chemistry, Volume 108, 2011.

EXTERNAL OFFICES, REVIEW/ADVISORY COMMITTEES and other SERVICE:

International Scientific Advisory Board, Fritz Haber Institute of the Max Planck Society, Berlin, Germany, 2005-13
Pacific Northwest National Lab EMSL Scientific Advisory Committee, 2003-present
Sandia National Lab, Sunshine to Petrol (S2P) Program External Advisory Board, 2009-present
Plexera, LLC., Seattle, WA, http://www.plexera.com/Company/index.php (2009-present)
Lumera, Inc., Bothel, WA (2004-08)
University of Washington NESAC/BIO Advisory Board, 2005-10.
Scientific Advisory Board of the Fritz Haber Institute of the Max Planck Society – Chinese Academy of Sciences Partner Group "Structure-Activity relations of Model Systems for Heterogeneous Catalysis, 2010-present
Asemblon, Inc., Seattle, WA http://asemblon.com/ (2005-present)
National President, Phi Lambda Upsilon, Honorary Chemical Society, 2002-05
National Vice President, Phi Lambda Upsilon, Honorary Chemical Society 1999-02
Chair and Chair-Elect, Colloid and Surface Chemistry Division of the American Chemical Society, 1993 and 1992
Vice-Chairman, Colloid and Surface Chemistry Div. of the American Chemical Society, 1991
Idaho National Laboratory, Energy and Environment Science and Technology Directorate External Review Committee, 2010-present
Lawrence Berkeley National Lab, Materials Science Review, 2010
Co-Chair, Science Theme Advisory Panel, Surface and Interfacial Processes, EMSL, Pacific Northwest National Lab, 2009-present
IUPAC Task Group: Critical evaluation of thermodynamic properties of hydrogen storage materials: metal organic frameworks and metal or complex hydrides, 2009-11
Review Committee, Department of Chemistry, University of British Columbia, 2010
Panelist and Writer: DOE OBES Workshop on "Basic Research Needs in Catalysis for Energy Applications", Bethesda, MD, Aug. 6-8, 2007
Sandia National Lab, Materials Science Review, 2007

SYMPOSIA ORGANIZED:

International Advisory Committee, 25th European Conference on Surface Science (ECOSS), Jul. 28-Aug. 1, 2008, Liverpool, UK
DOE Contractors Annual Meeting, Catalysis and Surface Science, Chair: Future Directions, May 24-26, 2007
International Steering Committee, Joint 18th International Vacuum Congress (IVC-18), 2010 International Conference on Nanoscience and Technology (ICN+T 2010), 14th International Conference on Solid Surfaces (ICSS-14), and the 5th Vacuum and Surface Sciences Conference of Asia and Australia (VASSCAA-5), jointly held in Beijing, China, August 23-27, 2010.
Organizing Committee, North American Meeting of the Catalysis Society, CA, 2009
Organizing Committee, 5th International Workshop on Oxide Surfaces (IWOX-5), Lake Tahoe, NV, Jan. 2007

K-12 OUTREACH:

Founded a thriving Science Boosters Club at Roosevelt High School in Seattle and served as its Chair for the first three years (http://depts.washington.edu/sciboost/boosters.html)

Summary of Selected Professional Activities

Name: **Daniel T. Chiu** Date of Revised Vitae: **June 2010**
Rank: **Professor** Date of Ph.D.: **1998** Date of UW hire: **2000** Date of last promotion: **2006**

I. Courses Taught (only list course number & times taught, e.g. "CHEM 142 (12)"):

Chem 152 (~10 times), Chem 520 (~10 times). In addition, also lectured in Nanotechnology Frontiers class, and organized seminars in analytical chemistry as well as nanotechnology

II. Department and University Service:

Departmental Committees:

Faculty Search Committee; Graduate Student Recruiting Committee; Space Committee; Personnel Committee

College and University Committees:

Office of Tech Transfer Director Search Committee, Center for Nanotechnology Director Search Committee, School of Pharmacy Dean Search Committee, C4C-EFF Advisory Panel

~60	Total Other Graduate Supervisory Committees: (does not include students in own group)

III. Research Group (current):

12	graduate students	15	Postdoctoral associates	11	Ph.D.s granted (career total)
2	undergraduate students		other Visiting Faculty	**1**	Senior Staff Scientist

IV. Invited Lectures: From 2001 to 2010 ~150

2001 SPIE (San Jose, CA); Pittcon (New Orleans, LA); ACS Regional (Seattle, WA); Gordon Conference (CT); DARPA PI meeting (HI); Nanotech Joint Institute Workshop (Seattle, WA).

2002 Lab Automation (Palm Springs, CA); Western Washington University; Nanotech Joint Institute Workshop (Seattle, WA); FACSS (RI); Neuroscience Meeting (Orlando, FL); NIH Symposium in Maryland.

2003 Pittcon (Orlando, FL); Keck Foundation (Los Angeles, CA); CERC 3 Workshop in Sweden; International Symposium on CC&E (Las Vegas, NV); Annual Microscopy Society Meeting (San Antonio, TX) (2 invited talks); Nanotechnology Joint Institute Workshop (Seattle, WA); FACSS Annual Meeting (Fort Lauderdale, FL); Pomona and the Claremont Colleges

2004 SWAP Meeting in Salt Lake City; Penn State University in State College; Keck Foundation Annual Symposium in Los Angeles; CAMD Workshop in Baton Rouge; FACSS Annual Meeting in Portland (2 invited talks); Washington State University in Pullman; Fred Hutchinson Cancer Research Center in Seattle; Penn State University (State College, PA)**;** University of Texas at Austin (Austin, TX); Dept. of Physiology and Biophysics at UW (Seattle, WA); Boise State University (Boise, ID).

2005 Pittcon (Orlando, FL); MIT BioMEMS Seminar (Boston, MA); Keck Foundation Annual Symposium (Los Angeles, CA); Micro- and Nano- Fluidic Systems Workshop (Banff, Canada); International Symposium on CC&E (Las Vegas, NV); McKnight Neuroscience Conference (Aspen, CO); Keynote Speaker at Intl. Conf. on Micro & Mini Channels (Toronto, CA); Microfluidics Gordon Research Conference (Oxford, Britain); Colorado State University (Fort Collins, CO); Pacific Northwest Lab (Richland, WA); Combimatrix (Seattle, WA); ACS Meeting (Washington, DC); Indiana University (Bloomington, IN); PacifiChem (Honolulu, HI).

2006 UCLA (Los Angeles, CA); Pittcon (Orlando, FL); Suddath Symposium at Georgia Tech (Atlanta, GA); Stanford University (Stanford, CA); Purdue University (Lafayette, IN); Keck Foundation Annual Symposium (Los Angeles, CA); McKnight Neuroscience Conference (Aspen, CO); ACS Regional Meeting (Reno, NV); University of Science and Technology (Hong Kong); ACS National Meeting (San Francisco, CA); University of Pittsburgh (Pittsburgh, PA); University of California at Berkeley (Berkeley, CA); University of Illinois at Urbana (Urbana, IL); University of Florida at Gainsville (Gainsville, FL); Tsinghua University (Beijing, China); National Nanoscience Center of China (Beijing, China); Brigham Young University (Provo, UT).

2007 MSB (Vancouver, CA); Pittcon (Chicago, IL) (2 invited talks); University of Alberta (Edmonton, Alberta); University of Virginia (Charlottesville, Virginia); Keck Annual Symposium (Los Angeles, CA); Santa Clara University (San Jose, CA); Keynote Speaker at IEEE Transducers Meeting (Lyon, France); McKnight Neuroscience Conference (Aspen, CO); ACS National Meeting (Boston, MA); Chalmers University (Gothenburg, Sweden); Keynote Speaker at Intl Mech Eng Congress & Expo (Seattle, WA); Texas A&M University (College Station, TX); International Symposium on CC&E (Albuquerque, NM).

2008 Lab Automation (Palm Springs, CA); Louisiana State University (Baton Rougue, LA); University of Michigan (Ann Arbor, MI); Microfluidics and Nanofluidics (Cancun, Mexico); Pittcon (New Orleans, LA) (2 invited talks); ACS National Meeting (New Orleans, LA); Frontiers in Engineering National Academy Meeting (Irvine, CA); Keck Annual Symposium (LA, CA); CPAC (Seattle, WA); McKnight Neuroscience Conf (Aspen, CO); Simon Fraser University (Burnaby, Canada); University of Bari (Bari, Italy); University of Dundee (Dundee, Scotland); ACS

National Meeting (Philadelphia, PA); MicroNano Breakthrough Conf (Vancouver, WA); CPAC (Seattle, WA); Extreme Sensing (Maui, HI)

2009 MSB (Boston, MA); Purdue University (Lafayette, IN); Pittcon (Chicago, IL); Simon Fraser University (Burnaby, Canada); University of Arizona (Tucson, AZ); BIO RAD Annual Scientific Advisory Board Meeting (Hercules, CA); Optical Society of America Annual Meeting (Vancouver, Canada); CPAC (Seattle, WA); ISCCE Meeting (Portland, OR); Canadian Society of Chemistry Annual Meeting (Hamilton, Ontario, Canada); Microscopy Society Conference (Richland, VA); Institute for Bioprocess and Biosystems (Hamburg, Germany); Max Planck Institute for Biophysics (Goettingen, Germany); University of Wisconsin (Madison, WI); Joint Cold Spring Harbor Lab/Wellcome Trust Conference (Hinxton, UK); Frontiers in Optics (FiO)/Laser Science (LS) Conference (San Jose, CA); SysBio Conference (Hamburg, Germany); Molecular Probes/Life Technologies (Eugene, OR); Northeastern University (Boston, MA); University of North Dakota (Grand Forks, ND)

2010 Georgia Tech Chemistry (Atlanta, GA); Pittcon (3 invited lectures) (Orlando, FL); Tufts University (Boston, MA); New York University (New York, NY); CPAC (Seattle, WA); Merck/DNAx (Palo Alto, CA); UW Dept of Bioengineering (Seattle, WA); International Symposium on Microchemistry and Microsystems (Hong Kong); International Symposium on Bioanalysis, Biomedical Engineering, and Nanotechnology (Changsha, China); BioRad (Hercules, CA); SPIE (San Diego, CA); ACS National Meeting (Boston, MA); Georgia Tech (Atlanta, GA); Plenary Lecture for PBio Retreat (Leavenworth, WA); Center for Process Analytical Sponsor Meeting (Seattle, WA); 45th Session of the Joint UJNR Panel on Toxic Microorganisms (Seattle, WA); Faculty Lecture (Seattle, WA); University of North Carolina (Chapel Hill, NC); Glaxo Smithkline (Research Triangle, NC); Pacifichem (Honolulu, HI)

V. Publications: career total [131] in press [5] submitted [7] book chapters, reviews [>10]

Select Publications Since 2006:

1. C.L. Kuyper, K.L. Budzinski, R.M. Lorenz, D.T. Chiu (2006) "Real-time sizing of nanoparticles in microfluidic channels using confocal correlation spectroscopy" *J. Am. Chem. Soc.* 128, 730-731.
2. C.L. Kuyper, J.S. Kuo, S.A. Mutch, D.T. Chiu (2006) "Proton permeation into single vesicles occurs via a sequential two-step mechanism and is heterogeneous" *J. Am. Chem. Soc.* 128, 3233-3240.
3. M. He, J.S. Kuo, D.T. Chiu (2006) "Effects of ultrasmall orifices on the electrogeneration of femtoliter-volume aqueous droplets" *Langmuir* 22, 6408-6413.
4. R.M. Lorenz, J.S. Edgar, G.D.M. Jeffries, D.T. Chiu (2006) "Microfluidic and optical systems for the on-demand generation and manipulation of single femtoliter-volume aqueous droplets" *Anal. Chem.* 78, 6433-6439.
5. J.S. Edgar, C.P. Pabbati, R.M. Lorenz, M. He, G.S. Fiorini, D.T. Chiu (2006) "Capillary electrophoresis separation in the presence of an immiscible boundary for droplet analysis" *Anal. Chem.* 78, 6948-6954.
6. C.L. Kuyper, B. Fujimoto, Y. Zhao, P. Schiro, D.T. Chiu (2006) "Accurate sizing of nanoparticles using confocal correlation spectroscopy" *J. Phys. Chem. B.* 110, 24433-24441.
7. G.D.M. Jeffries, J.S. Kuo, D.T. Chiu (2007) "Dynamic modulation of chemical concentration in an aqueous droplet" *Angew. Chem. Int. Ed.* 46, 1326-1328.
8. R.M. Lorenz, J.S. Edgar, G.D.M. Jeffries, Y. Zhao, D. McGloin, D.T. Chiu (2007) "Vortex-trap induced fusion of femtoliter-volume aqueous droplets" *Anal. Chem.* 79, 224-228.
9. G.D.M. Jeffries, J.S. Edgar, Y. Zhao, J.P. Shelby, C. Fong, D.T. Chiu (2007) "Using polarization-shaped optical vortex traps for single cell nanosurgery" *Nano Lett.* 7, 415-420.
10. P.G. Schiro, C.L. Kuyper, D.T. Chiu (2007) "Continuous-flow single-molecule capillary electrophoresis with high detection efficiency" *Electrophoresis* 28, 2430-2438.
11. S.A. Mutch, B. Fujimoto, C.L. Kuyper, J.S. Kuo, S.M. Bajjalieh, D.T. Chiu (2007) "De-convolving single-molecule intensity distributions for quantitative microscopy measurements" *Biophys. J.* 92, 1-18.
12. G.D.M. Jeffries, J.S. Kuo, D.T. Chiu (2007) "Controlled shrinkage and re-expansion of a single aqueous droplet inside an optical vortex trap" *J. Phys. Chem. B* 111, 2806-2812.
13. Y. Zhao, B.S. Fujimoto, G.D.M. Jeffries, P.G. Schiro, D.T. Chiu (2007) "Optical gradient flow focusing" *Optics Express* 15, 6167-6176.
14. G.S. Fiorini, M. Yim, G.D.M. Jeffries, P. Schiro, S.A. Mutch, R.M. Lorenz, D.T. Chiu (2007) "Fabrication improvements for thermoset polyester (TPE) microfluidic devices" *Lab Chip* 7, 923-926.
15. A.E. Sgro, P.B. Allen, D.T. Chiu (2007) "Thermoelectric manipulations of aqueous droplets in microfluidc devices" *Anal. Chem.* 79, 4845-4851.
16. Y. Zhao, J.S. Edgar, G.D.M. Jeffries, D. McGloin, D.T. Chiu (2007) "Spin-to-orbital angular momentum conversion in a strongly focused optical beam" *Phys. Rev. Lett.* 99, 073901.
17. P.B. Allen, B.R. Doepker, D.T. Chiu (2007) "Fourier transform capillary electrophoresis with laminar flow gated pressure injection" *Anal. Chem.* 79, 6807-6815.
18. P.B. Allen, D.T. Chiu (2008) "Alzheimer's disease protein $A\beta_{1-42}$ does not disrupt isolated synaptic vesicles" *Biochim. Biophys. Acta - Molecular Basis of Disease* 1782, 326-334.

19. J.C. Gadd, C.L. Kuyper, B.S. Fujimoto, R.W. Allen, D.T. Chiu (2008) "Sizing subcellular organelles and nanoparticles confined within aqueous droplets" *Anal. Chem.* 80, 3450-3457.
20. Y. Zhao, G. Milne, J.S. Edgar, G.D.M. Jeffries, D. McGloin, D.T. Chiu (2008) "Quantitative force mapping in an optical vortex trap" *Appl. Phys. Lett.* 92, 161111.
21. P.B. Allen, A.E. Sgro, D.L. Chao, B.E. Doepker, J.S. Edgar, K. Shen, D.T. Chiu (2008) "Single-synapse ablation and long-term imaging in live *C. elegans*" *J. Neurosci. Meth.* 173, 20-26.
22. G. Milne, G.D.M. Jeffries, D.T. Chiu (2008) "Tunable generation of Bessel beams with a fluidic axicon" *Appl. Phys. Lett.* 92, 261101.
23. K.A. Dendramis, P.B. Allen, P. Reid, D.T. Chiu (2008) "Spectrally tunable uncaging of biological stimuli from nanocapsules" *Chem. Comm.* 4795-4797.
24. P.B. Allen and D.T. Chiu (2008) "Calcium assisted glass-to-glass bonding for fabrication of glass microfluidic devices" *Anal. Chem.* 80, 7153-7157.
25. J.S. Edgar, G. Milne, Y. Zhao, C.P. Pabbati, D.S.W. Lim, D.T. Chiu (2009) "Droplet compartmentalization of chemical separations" *Angew. Chem. Int. Ed.* 48, 2719-2722.
26. Y. Zhao, P. Schiro, J.S. Kuo, L.Y. Ng, D.T. Chiu (2009) "A simple and rapid method for the accurate preparation of cell-spiking standards" *Anal. Chem.* 81, 1285-1290.
27. D.T. Chiu & R.M. Lorenz (2009) "Chemistry and biology in femtoliter and picoliter volume droplets" *Accounts of Chem. Res.* 42, 649-658.
28. J.S. Kuo, L. Ng, G.S. Yen, R.M. Lorenz, P.G. Schiro, J.S. Edgar, Y. Zhao, D.S.W. Lim, P.B. Allen, G.D.M. Jeffries, D.T. Chiu (2009) "A new USP Class VI-compliant substrate for manufacturing disposable microfluidic devices" *Lab Chip* 9, 870-876.
29. J.S. Kuo, Y. Zhao, L. Ng, G.S. Yen, R.M. Lorenz, D.S.W. Lim, D.T. Chiu (2009) "Microfabricating high-aspect-ratio structures in polyurethane-methacrylate (PUMA) disposable microfluidic devices" *Lab Chip* 9, 1951-1956.
30. P.B. Allen, B.R. Doepker, D.T. Chiu (2009) "High-throughput capillary-electrophoresis analysis of the contents of single mitochondria" *Anal. Chem.* 81, 3784-3791.
31. M.B. Zeigler & D.T. Chiu (2009) "Laser selection significantly affects cell viability following single-cell nanosurgery" *Photochem. Photobiol.* 85, 1218-1224.
32. D.T. Chiu, R.M. Lorenz, G.D.M. Jeffries (2009) "Droplets for ultrasmall-volume analysis" *Anal. Chem.* 81, 5111-5118.
33. K.L. Budzinski, R.W. Allen, B.S. Fujimoto, P. Kensel-Hammes, D.M. Belnap, S.M. Bajjalieh, D.T. Chiu (2009) "Large structural change in isolated synaptic vesicles upon loading with neurotransmitter" *Biophys. J.* 97, 2577-2584.
34. G.D.M. Jeffries, G. Milne, Y. Zhao, C. Lopez-Mariscal, D.T. Chiu (2009) "Optofluidic generation of Laguerre-Gaussian beams" *Optics Express* 17, 17555-17562.
35. K.A. Dendramis & D.T. Chiu (2009) "Laser photolysis of dye-sensitized nanocapsules occurs via a photothermal pathway" *J. Amer. Chem. Soc.* 131, 16771-16778.
36. J. Hurtig, D.T. Chiu, B. Onfelt (2010) "Intercellular nanotubes: Insights from imaging studies and beyond" *Wiley Interdisciplinary Review in Nanomedicine and Nanobiotechnology* 2, 260-276.
37. P.B. Allen, G. Milne, B.R. Doepker, D.T. Chiu (2010) "Pressure-driven laminar-flow switching for rapid exchange of solution environment around surface adhered biological particles" *Lab Chip* 10, 727-733.
38. J.S. Kuo, Y. Zhao, P.G. Schiro, L. Ng, D.S.W. Lim, J.P. Shelby, D.T. Chiu (2010) "Deformability Considerations in Filtration of Biological Cells" *Lab Chip* 10, 837-842.
39. M.J. Han, D.T. Chiu, E.C. Koc (2010) "Regulation of mitochondrial ribosomal protein S29 (MRPS29) expression by a 5'-upstream open reading frame" *Mitochondrion* 10, 274-283.
40. P.B. Smith, K.A. Dendramis, D.T. Chiu (2010) "Investigating lyophilization of lipid nanocapsules with fluorescence correlation spectroscopy" *Langmuir* 26, 10218-10222.
41. G. Milne, Y. Zhao, D.T. Chiu (2010) "High precision measurement and analysis of colloidal monolayers" *Anal. Chem.* 82, 3943-3949.
42. A.E. Sgro, D.T. Chiu (2010) "Droplet freezing, docking, and the exchange of immiscible phase and surfactant around frozen droplets" *Lab Chip* 10, 1873-1877.
43. D.E. Cohen, T. Schneider, M. Wang, D.T. Chiu (2010) "Self-digitization of sample volumes" *Anal. Chem.* 82, 5707-5717.
44. C. Wu, T. Schneider, M. Zeigler, J. Yu, P.G. Schiro, D.R. Burnham, J.D. McNeill, D.T. Chiu (2010) "Bioconjugation of ultrabright semiconducting polymer dots for specific cellular targeting" *J. Amer. Chem. Soc.* 132, 15410-15417.
45. C. Wu, Y. Jin, T. Schneider, D. Burnham, and D.T. Chiu (2010) "Ultra-bright and bio-orthogonal labeling of cellular targets using semiconducting polymer dots and click chemistry" *Angew. Chem. Int. Ed.* 49, 9436-9440.

46. G.D.M. Jeffries, R.M. Lorenz, D.T. Chiu (2010) "Ultrasensitive and High-Throughput Fluorescence Analysis of Droplet Contents with Orthogonal Line Confocal Excitation" *Anal. Chem.* 82, 9948-9954.
47. K.A.D. Gregersen, Z.B. Hill, J.C. Gadd, B.S. Fujimoto, D.J. Maly, D.T. Chiu (2010) "Intracellular Delivery of Bioactive Molecules using Light-Addressable Nanocapsules" *ACS Nano* 4, 7603-7611.
48. S.A. Mutch, P. Kensel-Hammes, J.C. Gadd, B.S. Fujimoto, R.W. Allen, P.G. Schiro, R.M. Lorenz, C.L. Kuyper, J.S. Kuo, S.M. Bajjalieh, D.T. Chiu (2011) "A quantitative single vesicle imaging technique reveals a subset of synaptic vesicle membrane proteins are trafficked with high precision" *J. Neurosci.* 31, 1461-1470.
49. G.S. Yen, B. Fujimoto, T. Schneider, D.T.K. Huynh, G.D.M. Jeffries, D.T. Chiu (2011) "A rapid and economical method for profiling feature heights during microfabrication" *Lab Chip* 11, 974-977.
50. Y.H. Chan, Y. Jin, C. Wu, D.T. Chiu (2011) "Copper (II) and iron (II) ion sensing with semiconducting polymer dots" *Chem. Comm.* 47, 2820-2822.
51. Y.H. Chan, C. Wu, F. Ye, Y. Jin, P.B. Smith, and D.T. Chiu (2011) "Development of Ultrabright Semiconducting Polymer Dots for Ratiometric pH Sensing" *Anal. Chem.* 83, 1448-1455.
52. Y.Jin, F. Ye, M.B. Zeigler, C. Wu, D.T. Chiu (2011) "Near-infrared fluorescent dye-doped semiconducting polymer dots" *ACS Nano* 5, 1468-1475.
53. C. Wu, S.J. Hansen, Q. Hou, J. Yu, M. Zeigler, Y. Jin, D.R. Burnham, J.D. McNeill, J.M. Olson, D.T. Chiu (2011) "Design of highly emissive polymer blend bioconjugates for in vivo tumor targeting" *Angew. Chem. Int. Ed.* 50, 3430-3434.
54. M.B. Zeigler, P.B. Allen, D.T. Chiu (2011) "Probing rotational viscosity in synaptic vesicles" *Biophys. J.* (in press).
55. F. Ye, C. Wu, Y. Jin, Y.H. Chan, X. Zhang, D.T. Chiu (2011) "Ratiometric temperature sensing with semiconducting polymer dots" *J. Amer. Chem. Soc.* (in press).

Over 30 patents have been granted and issued in various countries in the past 10 years.

VI. Grant Activity:

Currently Active Grants:

R01NS062725 National Institute of Health (NINDS) (PI)	07/01/08 – 06/30/12
Single-molecule studies of synaptic vesicles	~ 200,000 direct cost per year
R01GM085485 National Institute of Health (NIGMS) (PI)	08/01/08 – 07/31/12
Super Resolution Imaging with Difference Deconvolution Microscopy	~ 200,000 direct cost per year
CHE-0844688 National Science Foundation (PI)	02/15/09 – 01/31/12
Investigation of chemical reactions in femtoliter volume droplets	~ 150,000 total cost per year
CHE-0924320 National Science Foundation (PI)	09/01/09 – 08/31/12
CRC: Spatially Resolved Measurements of Cellular Releasates	~ 100,000 total cost per year
R21CA147831 National Institute of Health (NCI) (PI)	04/01/10 – 03/31/13
High Sensitivity Detection and Isolation of Circulating Tumor Cells	~ 140,000 direct cost per year
R01 NS 052637 National Institute of Health (NINDS) (PI)	08/15/05 – 05/31/14
High resolution analysis of synaptic vesicle proteins	~ 225,000 direct cost per year
R01 GM094905 National Institute of Health (NIGMS) (Co-PI)	09/01/10 – 08/31/14
Interfacing droplets with mass spectrometry for single-cell analysis	~ 200,000 direct cost per year
Subcontract from Tufts: DOD Innovator Award CDMRP (Co-PI)	07/01/11 – 06/30/16
Technologies for Early Detection and Stratification of Breast Cancer	~150,000 direct cost per year

---

VII. Honors and Awards:

UW Presidential Entrepreneurial Faculty Fellow, 2011; Analytical Chemistry Young Innovator Award, 2010; Pittcon Achievement Award, 2009; Kavli Fellow, 2008; American Chemical Society National Fresenius Award, 2007; Alfred P. Sloan Fellow, 2005; McKnight Technological Innovations in Neuroscience Award, 2004; Keck Distinguished Young Scholar in Biomedical Research, 2003; NIH Cutting-Edge Technology in Basic Research Award, 2002; National Science Foundation Career Award, 2002; Research Corporation's Research Innovation Award, 2000; Dreyfus New Faculty Award, 2000.

Standing Chair of the NIH ISD (Instrument Systems Development) Study Panel (2010-2012); Chair, NIH BST Nanotechnology Study Panel (July 2007); Member, Editorial Board of Analytical Chemistry for A-Page Articles (2008-2011); Member, National Academy of Sciences' Committee on Global Science and Technology Strategies and Their Effect on U.S. National Security (2009-2010).

Summary of Selected Professional Activities

Name: Gary Drobny — Date of Revised Vitae: 6/2011
Rank: Professor — Date of Ph.D.: 1981 — Date of UW hire: 1987 — Date of last promotion: 1991

I. Courses Taught (only list course number & times taught, e.g. "CHEM 142 (12)"):

CHEM 452 (10)
CHEM 453 (10)
CHEM 553 (11)

II. Department and University Service:

Departmental Committees:

Research Services
Space Committee (Chair)
Undergraduate Education
Safety
Awards Committee

College and University Committees:

Participated in University Committee to Determine Routing of Sound Transit through UW Campus.

30 Total Other Graduate Supervisory Committees: (does not include students in own group)

III. Research Group (current):

4 graduate students	3 Postdoctoral associates	34 Ph.D.s granted (career total)
1 undergraduate students	other Visiting Faculty	

IV. Invited Lectures: career total 42 Since 2001

2001:

G. Drobny "Solid State NMR Methods for Determining the Structure of Proteins at Biomaterial Interfaces, Chemistry Department, University of British Columbia, Vancouver, BC (Feb. 2001)

G. Drobny "Solid State NMR Methods for Determining the Structure of Proteins at Biomaterial Interfaces, NMR Methods for Studying the structures of Proteins and Nucleic Acids" Dept. of Chemistry, Washington University, St. Louis MO (March 2001).

G. Drobny "Solid State NMR Methods for Determining the Structure of Proteins at Biomaterial Interfaces, NMR Methods for Studying the structures of Proteins and Nucleic Acids" Dept. of Chemistry, University OF Iowa, Ames, IO (March 2001).

G. Drobny "Solid State NMR Methods for Determining the Structure of Proteins at Biomaterial Interfaces, NMR Methods for Studying the structures of Proteins and Nucleic Acids"NIH Bethesda, MD, IO (June 2001).

G. Drobny "Solid State NMR Methods for Determining the Structure of Proteins at Biomaterial Interfaces, International Society of Magnetic Resonance, Rhodes, Greece (Summer 2001)

2002

G. Drobny "Solid State NMR Methods for Determining the Structure of Proteins at Biomaterial Interfaces, Biophysical Society, San Francisco, CA (Feb. 2002)

G. Drobny "Solid State NMR Methods for Determining the Structure of Proteins at Biomaterial Interfaces, Biophysical Society, San Francisco State University, CA (Feb. 2002)

G. Drobny "Solid State NMR Methods for Determining the Structure of Proteins at Biomaterial Interfaces, Dept. of Chemistry, New York University, NY (March 2002).

G. Drobny "Solid State NMR Studies of Dynamic and Structural Aspect of Biomolecular Recognition at Material Interfaces, 43rd Annual Experimental NMR Conference, Asilomar, CA (April 2002).

J. Long, P.S. Stayton, & G. Drobny " Dipolar Recoupling Pulse Sequences" 43rd Annual Experimental NMR Conference (April 2002).

G. Drobny " Solid State nMR Studies of Biomaterials" Kwiram Symposium, University of Washington, Seattle (August 2002).

G. Drobny ",Solid State NMR Studies of Dynamic and Structural Aspect of Biomolecular Recognition at Material Interfaces " International Conference on Magnetic Resonance in Biological Systems, Toronto, CN (August 2002).

G. Drobny "Dynamic Aspects of Protein-Nucleic Acid Recognition" Dept. of Physics, College of William and Mary, VA (Oct. 2002).

2003

G. Drobny ",Solid State NMR Studies of Dynamic and Structural Aspect of Biomolecular Recognition at Material Interfaces "Dept. of Chemistry, Pacific Lutheran University, Tacoma, WA (May. 2003)

G. Drobny ",Solid State NMR Studies of Dynamic and Structural Aspect of Biomolecular Recognition at Material Interfaces" Magnetic Resonance Gordon Conference", Newport, RI (June. 2003)

G. Drobny ",Solid State NMR Studies of Dynamic and Structural Aspect of Biomolecular Recognition at Material Interfaces "Dept. of Chemistry, University of California, Davis, CA (Sept. 2003).

2004

G. Drobny ",Solid State NMR Studies of Dynamic and Structural Aspect of Biomolecular Recognition at Material Interfaces "Dept. of Chemistry, ACS Conference, IUPUI, Indianapolis, ID (June 2004).

G. Drobny ",Solid State NMR Studies of Dynamic and Structural Aspect of Biomolecular Recognition at Material Interfaces "Dept. of Chemistry, Rocky Mountain Conference, Denver, CO (August 2004).

G. Drobny ",Solid State NMR Studies of Dynamic and Structural Aspect of Biomolecular Recognition at Material Interfaces "Dept. of Chemistry, University of Illinois, Chicago (November 2004).

2005

G. Drobny "Solid State NMR Studies of Dynamic and Structural Aspect of Biomolecular Recognition" Pines Symposium/Alpine Conference on Solid State NMR, Chamonix, France (Sept. 2005).

G. Drobny "Solid State NMR Studies of Dynamic and Structural Aspect of Biomolecular Recognition at Material Interfaces "Vanderbilt University (Sept. 2005).

G. Drobny "Solid State NMR Studies of Dynamic and Structural Aspect of Biomolecular Recognition at Material Interfaces " University of Aarhus, Denmark (scheduled for Oct. 2005).

2006

G. Drobny "Solid State NMR Studies of Dynamic and Structural Aspect of Biomolecular Recognition "NMR Workshop: College of William and Mary", Chamonix, France (March. 2006).

G. Drobny "NMR Studies of Surface-Bound Protein Structure", Rocky Mountain Conference, Denver (July 2006)

G. Drobny "Dynamics and Structural Aspects of Biomolecular Recognition" Washington University, Department of Chemistry. (Sept. 2006)

G. Drobny "NMR Studies of Surface-Bound Protein Structure", University of Aarhus, , Aarhus, Denmark (Nov. 2006)

2007

G. Drobny "Dynamics and Structural Aspects of RNA-Protein Recognition" ACS Meeting, Chicago (March 2007)

G. Drobny "Solid State NMR Studies of Protein Structure at Biomaterial interfaces" J. Michael Schurr Symposium, Seattle (Sept. 2007)

G. Drobny "Solid State NMR Studies of Protein Structure at Biomaterial Interfaces" University of Victoria, Victoria, BC (Dec. 2007)

G. Drobny "Solid State NMR Studies of Protein Structure at Biomaterial Interfaces"Simon Fraser University, Vancouver, BC (Dec. 2007)

2008

G. Drobny "Solid State NMR Studies of Protein Structure at Biomaterial Interfaces" Warwick University, Warwick, U.K. (Jan. 2008)

G. Drobny "Solid State NMR Studies of Protein Structure at Biomaterial Interfaces" ACS, Boston MA (August, 2008)

G. Drobny "Solid State NMR Studies of Protein Structure at Biomaterial Interfaces" Michigan state, Lansing MI (Sept. 2008)

2009

G. Drobny "Solid state NMR Studies of Conformational Capture in Proteins and Nucleic Acids" Keystone Meeting, Santa Fe NM (Feb. 2009)

G. Drobny "Solid state NMR Studies of Conformational Capture in Proteins and Nucleic Acids" Torchia Symposium, NIH Bethesda MD (June 2009)

G. Drobny "Solid state NMR Studies of Protein Structure at Biomaterial Interfaces"Rocky Mountain Conference NMR, Aspen, CO (July 2009)

G. Drobny "Solid state NMR Studies of RNA Dynamics" Workshop on RNa Dynamics, Telluride, CO (July 2009)

2010

G. Drobny "Solid state NMR Studies of Protein Structure at Biomaterial Interfaces" Experimental NMR Conference, Dayton, FL (April 2010)

G. Drobny "Solid state NMR Studies of Protein Structure at Biomaterial Interfaces Dept. Chemistry, Claremont/Pomono College (Sept. 2010)

G. Drobny 'NMR studies of Biosilification Proteins" Pacific Chem Conference Honolulu, HI (Dec. 2010).

2011

G. Drobny "Solid state NMR Studies of Protein Structure at Biomaterial Interfaces" Horbett Symposium UW Bioengineering (Feb. 2011)

G. Drobny "RNA Function and Dynamics" Workshop on RNA Dynamics, Telluride, CO (July 2011).

V. Publications: career total 130 in press 1 submitted 3 book chapters, reviews 10

100. Elizabeth A. Louie, V. Raghunathan, P. Chirakul, Snorri Th. Sigurdsson, G. P. Drobny "Measuring Long-Range Internuclear Distances with a Trifluoromethyl Group in Model Compounds and Biomolecules Using Solid-State $^{31}P\{^{19}F\}$ REDOR NMR" *J. Magn. Reson.* **2006** 178(1) 11-24.
101. Gil Goobes, Vinodhkumar Raghunathan, Elizabeth A. Louie[1], James M. Gibson, Gregory L. Olsen and Gary P. Drobny[*]"REDOR study on Diammonium Hydrogen Phosphate : A Model for Distance Measurements from Adsorbed Molecules to Surfaces" *Solid State Magn. Reson.* **2006** 29(1-3) 242-250.
102. M. Cotten, J.R. Long, P.S. Stayton & G.P. Drobny "Solid State NMR Studies of the Dynamics and Structure of Salivary Histatin-5 Adsorbed onto Hydroxyapatite Crystals" *J. Amer. Chem. Soc*. **2006** (under revision).
103. James M. Gibson, Jennifer M. Popham, Vinodhkumar Raghunathan, Patrick S. Stayton, and Gary P. Drobny "A $^{13}C\{^{31}P\}$ REDOR NMR Study of Aromatic Side Chain Interactions and Dynamics for a Statherin Fragment Bound to Hydroxyapatite Crystals", *J. Amer. Chem. Soc.* **2006** 128(16), 5364-5370.
104. Vinodhkumar Raghunathan, Elizabeth A. Louie, James M. Gibson, Jennifer M. Popham, Patrick S. Stayton, and Gary P. Drobny "A $^{15}N\{^{31}P\}$ REDOR and ^{31}P-^{31}P DRAWS NMR Study of Side Chain Interactions for a Statherin Fragment Bound to Hydroxyapatite Crystals",*J. Phys. Chem.* B. , **2006**, 110, 9324-9332.
105. Gil Goobes, Riki Goobes, Gary P. Drobny, and Patrick S. Stayton "Solid State NMR Studies of the Folding of Statherin on a Mineral Surface", Proc. Natl. Acad. Sci. USA **2006** 103: 44 16083-16088.
106. P. Miller, Z. Shajani, G. Varani, & Gary Drobny "Local Dynamics in the DNA Recognition Site for a methyl Tranferase: A Comparative Solution and Solid State NMR Study" *J. Amer. Chem. Soc.* **2006** 128: 50, 15970-15971..
107. Gil Goobes, Patrick Stayton, G.P. Drobny "Solid State NMR Studies of Biomolecular Recognition at Material Interfaces" *Progress in NMR Spectroscopy* **2007** 50, 71-85.
108. Riki Goobes, Gil Goobes, Wendy J. Shaw, Gary P. Drobny, Charles T. Campbell, Patrick S. Stayton "Thermodynamic Roles of Basic Amino Acids in Statherin Recognition of Hydroxyapatite" *Biochemistry* **2007,** 46, 4725-4733..
109. Shajani, Z.; Drobny, G.; Varani, G., Binding of U1A Protein Changes RNA Dynamics As Observed by 13C NMR Relaxation Studies. *Biochemistry* **2007,** 46 (20), 5875 -5883, **2007**.
110. Gil Goobes, Rivka Goobes, James M. Gibson, Joanna R. Long, Rajan Paranji, Jennifer M. Popham, Vinodhkumar Raghunathan, Wendy J. Shaw, Charles T. Campbell, Patrick S. Stayton and Gary P. Drobny "The Structure, Dynamics, and Energetics of Protein Adsorption – Lessons Learned from Adsorption of Statherin to Hydroxyapatite" *Magn. Reson. Chem*. 45, S32-S47 **2007**.
111. Thomas Engel, Gary Drobny, Phillip Reid "Physical Chemistry in the Life Sciences" Pearson-Prentiss Hall, **2008**
112. G. Olsen, D.C. Echodu, Z. Shajani, M.F. Bardaro, Jr., G. Varani, G.P. Drobny "Solid State Deuterium NMr Studies of HIV-1 TAR RNA Reveal Motions on the Micro-second-Nanosecond Time Scale, *J. Amer. Chem. Soc.* **130** (10), 2896 - 2897, **2008**.
113. G. A. Meints, P. Miller, K. Pedersen, Z. Shajani, & G. P. Drobny "Dynamics of the Furanose Rings in the *HhaI* Binding Site" *J.Amer. Chem. Soc.* **130** 7305**-, 2008**
114. K. Pedersen, G. A. Meints, Z. Shajani, P. Miller & G. P. Drobny "Dynamics of the Phosphodiester Backbone in the *HhaI* Binding Site" *J.Amer Chem Soc.* **2008** 130, 9072-9079.
115. D.C. Echodu, Z. Shajani, K. Pedersen, Jr., G. Varani, G.P. Drobny "A Comparative Study of Funaose Ring Dynamics in the HhaI Binding Site by Solution and Solid State NMR", *J. Phys. Chem.B* **2008,** 112 (44), 13934–13944.
116. Nivrutti B. Barhate[1], Rekha N. Barhate[1], Pavol Cekan[2], Gary Drobny[1] and Snorri Th. Sigurdsson "A Nanofluoro Nucleoside as a Sensitive ^{19}F-NMR Probe of Nucleic Acid Conformation"*Org. Lett.*. **2008** 10(13), 2745-2747.
117. Moise Ndao, Nicholas F. Breen, Jason Ash, Gil Goobes, P. S. Stayton, & G.P. Drobny "A $^{13}C\{^{31}P\}$ REDOR Study of the Role of Acidic Amino Acids in Protein-hydroxyapatite Surface Recognition" *Langm*uir **2009**, 25, 12136-12143.
118. G.L. Olsen, M. Barbardo, D. Echodu, G. Drobny, G. Varani "Hydration Dependent Dynamics in RNA" *J. Biomolec. NMR* **2009** 45:133-142.
119. Nicholas F. Breen, Tobias Weidner Kun Li, David Castner and Gary P. Drobny "A Solid-State Deuterium NMR and SFG Study of the Side Chain Dynamics in Peptides Adsorbed onto Hydrophobic Surfaces" *J. Amer. Chem. Soc.* **2009** 131, 14148-14149.
120. G.L. Olsen, M. Barbardo, D. Echodu, G. Drobny, G. Varani, "Atomic Motions of RNA in Space and Time" *J. Amer. Chem. Soc.*. **2009** 132: 1 303–308.

121. Kari Pederson, Prashant Emani, Dorothy Echodu, Greg Olsen, Michael Bardaro, Zahra Shajani, Paul Miller, Gary Meints, Gabriele Varani, Gary P. Drobny "Unifying Solution and Solid-State NMR Studies of Nucleic Acid Dynamics" *Encyclopedia of NMR* (in press) **2010**
122. Moise Ndao , Jason Ash, P. S. Stayton, & G.P. Drobny "A $^{13}C\{^{31}P\}$ REDOR Study of the Role of Basic Amino Acids in Protein-Hydroxyapatite Surface Recognition" *Surface Science* 604 :15-16, L39-L42 **2010**.
123. Michael F. Bardaro Jr.[a], Kari Pederson[a], Gary Drobny[a] and Gabriele Varani[a] ''Investigating RNA and DNA Dynamics through Nuclear Magnetic Resonance" Advance in Biomedical Spectroscopy : Advances in BioNMR Spectroscopy (in press) **2010.**
124. Tobias Weidner, Nicholas F. Breen, Kun Li, Gary Drobny, David Castner "A Sum Frequency Generation and Solid-State NMR Study Peptide Structure, Orientation and Dynamics of Polystyrene-adsorbed Peptides" *PNAS* 107(30), 13289 **2010.**
125. P. Emani, D.C. Echodu, G. Olsen, G. Varani, G.P. Drobny "A Slow Exchange Theory of Non-Rigid Rotation in TAR RNA". *J. Phys. Chem. B* (published ASAP) **2010.**
126. David Masica, Jason Ash, Moise Ndao, Gary Drobny, Jeffrey Gray "Toward a Structure Determination Method for Biomineral-Associated Protein Using Combined Solid- State NMR and Computational Structure Prediction" *Structure 18:12, 1678-1687* 2010**.**
127. Wei Huang, Gabriele Varani and Gary P. Drobny " ^{13}C-^{19}F and ^{15}N-^{19}F Intermolecular REDOR NMR Study of the Interaction of TAR RNA with Tat Peptides" *J. Amer. Chem. Soc.* 132 (50), 17643–17645 2010 **2010**.
128. Nicholas F. Breen, Kun Li, Gregory L. Olsen, Gary Drobny "A Solid-State Deuterium MAS NMR Study of Leucine Peptide Dynamics on Polystyrene Surfaces" *J. Phys. Chem. B* (in press).
129. Wei Huang, Gabriele Varani and Gary P. Drobny „Intermolecular REDOR NMR Study of the Interaction of TAR RNA Side Chains with Tat Peptides"*J. Biomolec. NMR* (submitted)**.**
130. P. Emani, G. Olsen, G. Varani, G.P. Drobny General Theory of Non-rigid Rotation and NMR Relaxation in TAR RNA *J. Phys. Chem. B.* (submitted).

VI. Grant Activity:

Current:

RO1 DE 12554-06 (PI: Stayton) 5/01/08-4/30/12 .45 academic
NIH (co-PI's Drobny, A. Campbell) Annual Direct Costs: $125,000
"Studies of Biomineralization Proteins"
The purpose of this grant is to apply solid state NMR methods to the study of the interaction of proteins and polypeptides with hydroxyapatite surfaces.

RO1 EB03152-O9 (PI) 07/01/08-6/30/12 .5 summer
NIH (co-PI Gabriele Varani) Annual Direct Cost: $312,428
"Dynamic Dynamics in Nucleic Acid-Protein Recognition"
This proposal uses Solid State NMR and Solution NMR to study dynamic aspects of protein-nucleic acid recognition.

MCB-0642253-01 (PI: Varani) 09/1/07-8/31/10 .5 summer
NSF (Co-PI Drobny) Annual Direct Cost: $154,365
"Dynamic NMR Studies of TAR-tat Recognition"
The major goal of this project is to deal with a different molecular system than EB03152.

1S10RR025467-01(PI) 06/01/09-05/31/10
NIH (NCRR) Shared instrumentation Grant with coPIs G. Varani and R. Klevit Direct Annual Costs: $500,000
"Acquisition of a Solid State NMR 500 MHz. Console and Probes"
This is a Shared instrumentation grant to acquire a 500 MHz. solid state NMR console and probes for use on an existing magnet.
Overlap; none

1S10RR029217-01(Drobny) 12/01/2009-11/30/10
NIH High End instrumentation Proposal with coPI's R. Klevit and G. Varani Direct Annual Costs: $2,662,200
"Acquisition of a 800 MHz NMR Spectrometer"

VII. Awards and Honors:

VIII. Additional Comments:

Summary of Selected Professional Activities

Name: Daniel R. Gamelin — Date of Revised Vitae: 6/6/2011

Rank: Professor — Date of Ph.D.: **1998** — Date of UW hire: **2000** — Date of last promotion: **2008**

I. Courses Taught (only list course number & times taught, e.g. "CHEM 142 (12)"):

Chem. 152, Introductory Chemistry (undergrad, W2002, enrollment: 273)
Chem. 162, Introductory Chemistry (undergrad, S2003 and S2004, enrollment: ~290)
Chem. 317, Inorganic Chemistry Laboratory (undergrad, W2005, S2006, enrollment: ~32)
Chem. 312, Introduction to Inorganic Chemistry (undergrad, W2001, enrollment: 115)
Chem. 508, Advanced Inorganic Chemistry, Physical Methods (A2000-A2007, A2009-A2011, enrollment: ~20)
Chem. 510 (Special Topics): The Inorganic Chemistry of Solar Energy Conversion (S2007, S2009-S2011, enrollment ~14)

II. Department and University Service:

Departmental Committees: Faculty Search (2005-11, Inorganic search chair in 2005-06, Solar search co-chair 2008-09, 2009-10, 2010-11); Library (2009); Junior faculty review (2009, 2010, 2011); Chemistry facilities (2008-11); Safety (2004-05); Graduate Student Recruiting Committee (2002-07 [chair, 2003-04])

College and University Committees: Steering Committee of the UW/PNNL Joint Institutes for Nanoscience (2004-07); 2y2d focus group (2009); Innovation Team, Advanced Materials for Energy (AME) Institute

~75 Total Other Graduate Supervisory Committees: (does not include students in own group)

III. Research Group (current):

8.5	graduate students	5	Postdoctoral associates	8	Ph.D.s granted (career total)
3	undergraduate students	2	other Visiting Faculty		

IV. Invited Lectures: career total ~105

2003-present:

2012: U. So. Cal. (TBD); U. Waterloo; U. Rochester; U. Wisconsin

2011: Dalton Transactions Americas Lecturer, U.C. Berkeley; Iowa State, Chem.; U. Calgary, Chem.; Center for Integrated Nanotech. (CINT) User Workshop, Albuquerque; Nat'l ACS meeting, Denver (inv.); 56th Ann. Int'l Soc. for Optical Eng. (SPIE), San Diego (inv.); Excited State Processes in Electronic/Bio-Nanomaterials (ESP-2011), Santa Fe; BC Inorg. Discussion Weekend, Squamish (Plenary); LBNL/Molecular Foundry Seminar; Stanford U., Materials Science Colloq.; U. So. Carolina, Chem.

2010: U. Victoria, Chem.; ACS Award symp. for Bill Buhro (Washington U., St. Louis); Orcas 2010 Intl Conf. on Energy Conversion; GRC Defects in Semiconductors; Complex Materials for Energy Conf. (Mich. St.); Ornstein Colloq. and Debye Spring School, Utrecht (cancelled by volcano!); APS March Mtg (inv.); U. Notre Dame, Physics Colloq.; UW, Nanotech Sem.

2009: Texas A&M P-Chem Sem.; UC Riverside, Chem. Sem.; UCSD, Chem. Sem.; SUNY Buffalo Phys. Colloq.; 14th Int'l Conf on II-VI Compounds, St. Petersburg (inv.); U. Konstanz, Zukunftskolleg Lect.; Harvard-MIT Inorg. Sem. Series; UW Condensed Matter & Atomic Phys. Sem.; Los Alamos Nat'l Lab., Nano Center (CINT); Yale U., Chem. Sem.; UW MSE Sem.

2008: U. Minnesota, Chem. Sem.; U. Duisburg, Electrical Eng. Colloq.; 5th Int'l Conf. on Semicond. Quantum Dots, Gyeongju, Korea (inv.); U. Bern, Chem. Special Sem.; APS March Mtg. (inv.); Caltech, Inorg. & Electrochem. Sem.; École Polytechnique Féd. de Lausanne (EPFL-LPI); Ornstein Colloq., Utrecht U.

2007: Nat'l MRS Mtg. (inv.); Columbia, Chem. Colloq.; Cornell, Chem.; 36th Int'l Sch. on the Physics of Semicond. Compounds, Ustron-Jaszowiec, Poland (inv. guest lecturer); Whitman Col., Chem.; Cherry Emerson Lecturer, GeorgiaTech, Chem.; UCLA, Chem.

2006: U. Geneva, Chem. Sem.; Int'l Workshop on Spectroscopy of Semicond. Nanoparticles, Duisburg (inv.); U. Konstanz, Phys. Seminar; Handai Int'l Symp. on Nanosci. & Nanotech., Osaka (inv.); AVS 53rd Int'l Symp. (inv.); Cornell, Chem. Symp.; European Mat. Rsch. Soc., Warsaw (inv.); 51st Ann. Int'l Soc. for Optical Eng. (SPIE), San Diego (inv.); U. Bern, Chem. (Güdel Symp.); UC Santa Cruz, Chem. Sem.; Colorado State U., Chem. Sem.; 231st ACS Nat'l Mtg. (inv.); Harvard, Chem. Seminar; Emory U., Chem. Sem.; Michigan State, Chem. Sem.; 1st Workshop on Doping of Semicond. Nanostruct., Naval Rsch. Lab. (inv.)

2005: 50th Magnetism & Magnetic Materials (MMM) Conf. (inv.); UW Chem. Sem. (tenure talk); Swiss NSF graduate symp., "Novel Materials," Villars-sur-Ollon (inv. lect., 4 lect.); PNNL, Inst. Sem.; U. Wisconsin, Chem. Sem.; Northwestern U., MSE Colloq.; CERC3 Young Chemists Workshop on "Functional Molecular Nanostructures", Baden-Baden, Germany (invited, nom. by NSF); UC Berkeley, Chem. Sem.; Caltech, Dow Lecturer in Inorg. Chem.; U. Chicago, Chem. Colloq.; Texas A&M, Chem. Sem.

2004: U. New Mexico, Chem. Seminar; U. British Columbia, Inorg. Seminar; UC Davis, Inorg. Seminar; UCLA, Inorg. Seminar; U. Illinois, Urbana-Champagne, Inorg. Seminar; U. Chicago, MRSEC Seminar; Caltech, Inorg./Electrochem Seminar; Reed College, Chem. Seminar, Sept. 2004; 41st Ann. Clay Minerals Soc. Meeting, Richland (inv); Stanford U., Chem. Seminar; MIT, Special Physical Chemistry Seminar; National MRS Meeting, San Francisco; Carnegie Mellon U., Chem. Seminar; Yale U., Chem. Seminar; Washington U., St. Louis, Chem. Seminar

2003: UCSD, Inorg. Sem.; 5th Int'l Workshop on Future Info. Processing Tech. (Miyazaki, Japan) (inv); 50th Int'l AVS Mtg, Baltimore (inv); U. Bern, Switzerland, Chem. Seminar; Boise St. U., Chem. Seminar; UW/PNNL Joint Workshop on Nanoscale Science & Tech., Seattle; 48th Ann. Int'l Soc for Optical Engin. (SPIE), San Diego (inv); GRC Inorg. Chem., Newport (inv); NSF-spons. Collab. Spintronics Research/Educ. Workshop, Seattle; NSF Workshop in Inorg. Chem., Jackson Hole (inv); Semicond. Research Corp., Front End Processes Review, Seattle (inv); National MRS Mtg, San Francisco; GRC Inorg. Reaction Mechanisms, Ventura (inv)

V. Publications: career total 98 — in press 0 — submitted 4 — book chapters, reviews 9

2005-present

Beaulac, R.; Feng, Y.; May, J. W.; Badaeva, E.; Gamelin, D. R.; Li, X., "Orbital Pathways for Mn^{2+}-Carrier *sp-d* Exchange in Magnetic Semiconductor Quantum Dots." *submitted*.

Score, D. S.; Neal, J. R.; Behan, A. J.; Mokhtari, A.; Feng, Q.; Alshammari, M. S.; Al-Qahtani, M. S.; Blythe, H. J.; Chantrell, R. W.; Heald, S. M.; Ochsenbein, S. T.; Gamelin, D. R.; Fox, M. A.; Gehring, G. A., "Enhanced magnetic properties in ZnCoAlO caused by exchange-coupling to Co nanoparticles." *submitted*.

Whitaker, K. M.; Raskin, M.; Kiliani, G.; Ochsenbein, S. T.; Fonin, M.; Rüdiger, U.; Leitenstorfer, A.; Gamelin, D. R.; Bratschitsch, R., "Spin-on Spintronics: Ultrafast Electron Spin Dynamics in ZnO and $Zn_{1-x}Co_xO$ Sol-Gel Films." *submitted*.

Johnson, C. A.; Cohn, A.; Kaspar, T. C.; Chambers, S. A.; Salley, G. M.; Gamelin, D. R., "Visible-Light Photoconductivity of $Zn_{1-x}Co_xO$ and its Dependence on Co^{2+} Concentration." *submitted*.

Bacher, G.; Schneider, L.; Beaulac, R.; Archer, P. I.; Gamelin, D. R., "Magnetic Polaron Formation Dynamics in Mn^{2+}-Doped Colloidal Nanocrystals up to Room Temperature." *submitted.*

White, M. A.; Weaver, A. L.; Beaulac, R.; Gamelin, D. R., "Electrochemically Controlled Auger Quenching of Mn^{2+} Photoluminescence in Doped Semiconductor Nanocrystals." *ACS Nano*, **2011**, 5, 4158.

Zhong, D. K.; Cornuz, M.; Sivula, K.; Grätzel, M.; Gamelin, D. R., "Photo-assisted Electrodeposition of Cobalt-Phosphate (Co-Pi) Catalyst on Hematite Photoanodes for Solar Water Oxidation." *Energy & Environmental Science*, **2011**, *4*, 1759.

Hayoun, R.; Whitaker, K.M.; Gamelin, DR; Mayer, JM, "Electron Transfer Between Colloidal ZnO Nanocrystals." *JACS*, **2011**, *133*, 4228.

Ochsenbein, S.T.; Gamelin, D.R., "Quantum Oscillations in Magnetically Doped Colloidal Nanocrystals." *Nature Nanotech.*, **2011**, *6*, 112.

Beaulac, R.; Gamelin, D. R., "Two-Center Formulation of Mn^{2+}-Electron *s-d* Exchange Coupling in Bulk and Quantum Confined Diluted-Magnetic Semiconductors." *Phys. Rev. B*, **2010**, *82*, 224401.

Johnson, C. A.; Kittilstved, K. R.; Kaspar, T. C.; Droubay, T. C.; Chambers, S. A.; Salley, G. M.; Gamelin, D. R., "Mid-Gap Electronic States in $Zn_{1-x}Mn_xO$." *Phys. Rev. B*, **2010**, *82*, 115202.

Vlaskin, V. A.; Janßen, N.; van Rijssel, J.; Beaulac, R.; Gamelin, D. R., "Tunable Dual Emission in Doped Semiconductor Nanocrystals." *Nano Letters*, **2010**, *10*, 3670.

Whitaker, K. M.; Ochsenbein, S. T.; Smith, A. L.; Echodu, D. C.; Robinson, B. H.; Gamelin, D. R., "Hyperfine Coupling in Colloidal n-type ZnO Quantum Dots: Effects on Electron Spin Relaxation." *J. Phys. Chem. C*, **2010**, *114*, 14467.

Sun, J.; Zhong, D. K.; Gamelin, D. R., "Composite Photoanodes for Photoelectrochemical Solar Water Splitting." *Energy & Environmental Science*, **2010**, *3*, 1252. (invited review)

Feng, Y.; Badaeva, E.; Gamelin, D. R.; Li, X., "Excited-State Double Exchange in Manganese-Doped ZnO Quantum Dots: A Time-Dependent Density-Functional Study." *J. Phys. Chem. Lett.*, **2010**, *1*, 1927.

White, M. A.; Lovejoy, T. C.; Ochsenbein, S. T.; Olmstead, M. A.; Gamelin, D. R., "Sputtering Induced Co^0 Formation in X-Ray Photoelectron Spectroscopy of Nanocrystalline $Zn_{1-x}Co_xO$ Spinodal Enrichment Models." *J. Appl. Phys.*, **2010**, *107*, 103917.

Photovoltaics and Optoelectronics from Nanoparticles, edited by M. Winterer, W.L. Gladfelter, D.R. Gamelin, S. Oda, *Mater. Res. Soc. Symp. Proc.* **2010**, vol. 1260. (edited conference proceedings book)

Zhong, D. K.; Gamelin, D. R., "Photoelectrochemical Water Oxidation by Cobalt Catalyst ("Co-Pi")/α-Fe_2O_3 Composite Photoanodes: Oxygen Evolution and Resolution of a Kinetic Bottleneck." *J. Am. Chem. Soc.*, **2010**, *132*, 4202.

Johnson, C.A.; Kaspar, T.C.; Chambers, S.A.; Salley, G.M.; Gamelin, D.R., "Sub-Bandgap Photoconductivity in Co^{2+}-Doped ZnO." *Phys. Rev. B*, **2010**, *81*, 125206.

Beaulac, R.; Ochsenbein, S. T.; Gamelin, D. R., "Colloidal Transition-Metal-Doped Quantum Dots." Chapter 7 in *Nanocrystal Quantum Dots*, 2nd edition (edited by V. I. Klimov), **2010**, CRC Press, 397. (invited review)

Lee, H.J.; Wang, M.; Chen, P.; Gamelin, D.R.; Zakeeruddin, S.M.; Grätzel, M.; Nazeeruddin, Md.K., "Efficient CdSe Quantum-Dot-Sensitized Solar Cells Prepared by an Improved Successive Ionic Layer Adsorption and Reaction (SILAR) Process." *Nano Lett.*, **2009**, *9*, 4221.

Vlaskin, V. A.; Beaulac, R.; Gamelin, D. R., "Dopant-Carrier Magnetic Exchange Coupling in Inverted Core/Shell Nanocrystals." *Nano Letters*, **2009**, *9*, 4376.

Beaulac, R.; Schneider, L.; Archer, P.I.; Bacher, G.; Gamelin, D.R., "Light-Induced Spontaneous Magnetization in Colloidal Doped QDs." *Science*, **2009**, *325*, 973.

Ochsenbein, S. T.; Feng, Y.; Whitaker, K. M.; Badaeva, E.; Liu, W. K.; Li, X.; Gamelin, D. R., "Charge-Controlled Magnetism in Colloidal Doped Semiconductor Nanocrystals." *Nature Nanotech.*, **2009**, *4*, 681.

Zhong, D. K.; Sun, J.; Inumaru, H.; Gamelin, D. R., "Solar Water Oxidation by Composite Catalyst/α-Fe_2O_3 Photoanodes." *J. Am. Chem. Soc.*, **2009**, *131*, 6086.

Lee, H. J.; Chen, P.; Moon, S.-J.; Sivula, K.; Besso, T.; Gamelin D. R.; Comte, P.; Zakeeruddin, S. M.; Grätzel, M.; Nazeeruddin, Md. K., "Regenerative PbS and CdS Quantum Dot-Sensitized Solar Cells with a Cobalt Complex as a Hole Mediator." *Langmuir*, **2009**, *25*, 7602.

Badaeva, E.; Isborn, C. M.; Feng, Y.; Ochsenbein, S. T.; Gamelin, D. R.; Li, X., "Theoretical Characterization of Electronic Transitions in Co^{2+}- and Mn^{2+}-Doped ZnO Nanocrystals." *J. Phys. Chem. C*, **2009**, *113*, 8710.

Droubay, T. C.; Keavney, D. J.; Kaspar, T. C.; Heald, S. M.; Wang, C. M.; Johnson, C. A.; Whitaker, K. M.; Gamelin, D. R.; Chambers, S. A., "Correlated Substitution in Paramagnetic Mn^{2+}-Doped ZnO Epitaxial Films." *Phys. Rev. B*, **2009**, *79*, 155203.

White, M. A.; Ochsenbein, S. T.; Gamelin, D. R., "Colloidal Nanocrystals of Wurtzite $Zn_{1-x}Co_xO$ ($0 \leq x \leq 1$): Models of Spinodal Decomposition in an Oxide Diluted Magnetic Semiconductor." *Chem. Mater.*, **2008**, *20*, 7107.

Beaulac, R.; Archer, P. I.; Ochsenbein, S. T.; Gamelin, D. R., "Colloidal Mn^{2+}-Doped CdSe Quantum Dots: New Inorganic Materials for Spin-Electronics and Spin-Photonics." *Adv. Funct. Mater.*, **2008**, *18*, 3873 (invited *Feature Article*).

Beaulac, R.; Archer, P.I.; van Rijssel, J.; Meijerink, A.; Gamelin, D.R.,"Exciton Storage in Colloidal Mn^{2+}-Doped CdSe Quantum Dots." *Nano Letters*, **2008**, *8*, 2949.

Whitaker, K. M.; Ochsenbein, S. T.; Polinger, V. Z.; Gamelin, D. R., "Electron Confinement Effects in the EPR Spectra of Colloidal n-Type ZnO Quantum Dots." *J. Phys. Chem. C*, **2008**, *112*, 14331.

Janßen, N.; Whitaker, K. M.; Gamelin, D. R.; Bratschitsch, R., "Ultrafast Spin Dynamics in Colloidal ZnO QDs." *Nano Lett*, **2008**, *8*, 1991.

Beaulac, R.; Archer, P.I.; Gamelin, D.R. "Luminescence in Colloidal Mn^{2+}-Doped Semiconductor Nanocrystals." ***J. Solid State Chem.***, **2008**, *181*, 1585. (inv. rev.)

Thomay, T.; Hanke, T.; Tomas, M.; Sotier, F.; Beha, K.; Knittel, V.; Kahl, M.; Whitaker, K. M.; Gamelin, D. R.; Leitenstorfer, A.; Bratschitsch, R., "Colloidal ZnO Quantum Dots in Ultraviolet Pillar Microcavities." *Optics Express*, **2008**, *16*, 9791.

Badaeva, E.; Feng, Y.; Gamelin, D.R.; Li, X. "Investigation of Pure and Co^{2+}-Doped ZnO Quantum Dot Electronic Structures using Density Functional Theory: Choosing the Right Functional." *New J. Physics*, **2008**, *10*, 055013. (invited article)

Beaulac, B.; Archer, P. I.; Liu, X.; Lee, S.; Salley, G. M.; Dobrowolska, M.; Furdyna, J. K.; Gamelin, D. R. "Spin-Polarizable Excitonic Luminescence in Colloidal Mn^{2+}-Doped CdSe Quantum Dots." *Nano Letters*, **2008**, *8*, 1197.

Kaspar, T.C.; Droubay, T.; Li, Y.; Heald, S.M.; Nachimuthu, P.; Wang, C.M.; Shutthanandan, V.; Johnson, C.A.; Gamelin, D.R.; Chambers, S.A. "Lack of Ferromagnetism in *n*-Type Cobalt-Doped ZnO Epitaxial Thin Films." *New J. Physics*, **2008**, *10*, 055010. (invited article)

Archer, P. I., Santangelo, S. A., Gamelin, D. R. "Inorganic Cluster Syntheses of TM^{2+}-Doped Quantum Dots (CdSe, CdS, CdSe/CdS): Physical Property Dependence on Dopant Locale." ***J. Am. Chem. Soc.***, **2007**, *129*, 9808.

Liu, W. K.; Whitaker, K. M.; Smith, A. L.; Kittilstved, K. R.; Robinson, B. H.; Gamelin, D. R. "Room-Temperature Electron Spin Dynamics in Free-Standing ZnO Quantum Dots." ***Phys. Rev. Lett.***, **2007**, *98*, 186804.

Archer, P. I.; Santangelo, S. A.; Gamelin, D. R. "Direct Observation of *sp-d* Exchange Interactions in Mn^{2+}- and Co^{2+}-doped CdSe QDs." *Nano Lett.*, **2007**, *7*, 1037.

Santangelo, S. A.; Hinds, E. A.; Vlaskin, V. A.; Archer, P. I.; Gamelin, D. R. "Bimodal Bond-Length Distributions in Cobalt-Doped CdSe, ZnSe, and $Cd_{1-x}Zn_xSe$ Quantum Dots." ***J. Am. Chem. Soc.***, **2007**, *129*, 3973.

Chambers, S. A.; Schwartz, D. A.; Liu, W. K.; Kittilstved, K. R.; Gamelin, D. R. "Growth, Electronic and Magnetic Properties of Doped ZnO Epitaxial and Nanocrystalline Films." *Applied Physics A*, **2007**, *88*, 1. (invited research article)

Archer, P.I.; Gamelin, D.R. "Chemical Approaches using Nanocrystals to Control Lattice Defect Formation and Explore the High-T_C Ferromagnetism of Oxide Diluted Magnetic Semiconductors." Chapter in *Magnetism in New Semiconducting & Insulating Oxides*, ed. N.H. Hong, **2007**, Research Signpost Press (invited review)

Norberg, N. S.; Dalpian, G. M.; Chelikowsky, J. R.; Gamelin, D. R. "Energetic Pinning of Magnetic Impurity Levels in Quantum Confined Semiconductor Nanocrystals." *Nano Letters*, **2006**, *6*, 2887.

Chambers, S. A.; Droubay, T. C.; Rosso, K.; Heald, S. M.; Schwartz, D. A.; Kittilstved, K. R.; Gamelin, D. R. "Electron Mediated Ferromagnetism in Oxide Semiconductors?" *Materials Today*, **2006**, *9*, 28. (invited review)

Kittilstved, K. R.; Schwartz, D. A.; Tuan, A. C.; Heald, S. M.; Chambers, S. A.; Gamelin, D. R. "Direct Kinetic Correlation of Carriers and Ferromagnetism in Co^{2+}:ZnO." ***Phys. Rev. Lett.***, **2006**, *97*, 037203.

Norberg, NS; Parks, GL; Salley, GM; Gamelin, D "Giant Excitonic Zeeman Splittings in Co^{2+}-doped ZnSe QDs." ***JACS,*** **2006**, *128*, 13195.

Liu, W.K.; Whitaker, K.M.; Kittilstved, K.R.; Gamelin, D.R. "Stable Photogenerated Carriers in Magnetic Semiconductor Nanocrystals." ***J. Am. Chem. Soc.***, **2006**, *128*, 3910.

Kaspar, T. C.; Droubay, T.; Shutthanandan, V.; Heald, S. M.; Wang, C. M.; McCready, D. E.; Thevuthasan, S.; Bryan, J. D.; Gamelin, D. R.; Kellock, A. J.; Toney, M. F.; Hong, X.; Ahn, C. H.; Chambers, S. A. "Ferromagnetism and Structure in Epitaxial Cr-doped Anatase TiO_2." ***Phys. Rev. B***, **2006**, *73*, 155327.

Kittilstved, K.R.; Zhou, J.; Liu, W.K.; Bryan, J.D.; Schwartz, D.A.; Gamelin, D.R. "MCD of Ferromagnetic Co^{2+}-doped ZnO." ***Appl. Phys. Lett.***, **2006**, *89*, 062510.

Kittilstved, K.R.; Gamelin, D.R. "Manipulating Polar Ferromagnetism in Transition Metal Doped ZnO." ***J. Appl. Phys.***, **2006**, *99*, 08M112. (inv.)

Archer, P.I.; Gamelin, D.R. "Controlled Grain Boundary Defect Formation and...High-T_C FM of Ni^{2+}:SnO_2." ***J. Appl. Phys.***, **2006**, *99*, 08M107.

Kittilstved, K.R.; Liu, W.K.; Gamelin, D.R. "Electronic Structure Origins of Polarity Dependent High-T_C FM in Oxide DMSs." *Nature Materials*, **2006**, *5*, 291.

Norberg, N.S.; Gamelin, D.R. "Giant Zeeman Effects in Colloidal DMS Quantum Dots with Homogeneous Dopant Speciation." ***J. Appl. Phys.***, **2006**, *99*, 08M104.

Kaspar, T. C.; Heald, S. M.; Wang, C. M.; Bryan, J. D.; Droubay, T.; Shutthanandan, V.; Thevuthasan, S.; McCready, D. E.; Kellock, A. J.; Gamelin, D. R.; Chambers, S. A. "Negligible Magnetism in Excellent Structural Quality $Cr_xTi_{1-x}O_2$ Anatase: Contrast with High-T_C Ferromagnetism in Structurally Defective $Cr_xTi_{1-x}O_2$." ***PRL***, **2005**, *95*, 217203.

Bryan, J. D.; Santangelo, S. A.; Keveren, S. C.; Gamelin, D. R. "Activation of High-T_C Ferromagnetism in Co^{2+}:TiO_2 and Cr^{3+}:TiO_2 Nanorods and Nanocrystals by Grain Boundary Defects." ***J. Am. Chem. Soc.***, **2005**, *127*, 15568.

Norberg, N. S.; Gamelin, D. R. "Influence of Surface Modification on the Luminescence of Colloidal ZnO Nanocrystals." ***J. Phys. Chem. B***, **2005**, *109*, 20810.

Archer, P. I.; Radovanovic, P. V.; Heald, S. M.; Gamelin, D. R. "Low-Temperature Activation and Deactivation of High-T_C Ferromagnetism in a New Diluted Magnetic Semiconductor: Ni^{2+}-Doped SnO_2." ***J. Am. Chem. Soc.***, **2005**, *127*, 14479.

Liu, W.K.; Salley, G.M.; Gamelin, D.R. "Spectroscopy of Photovoltaic/Photoconductive Nanocryst Co^{2+}-doped ZnO Electrodes." ***J. Phys. Chem. B***, **2005**, *109*, 14486.

Kittilstved, K.R.; Norberg, N.S.; Gamelin, D.R. "Chemical Manipulation of 300K FM in ZnO Diluted Magnetic Semiconductors." ***Phys. Rev. Lett.***, **2005**, 149049.

Kittilstved, K.R.; Gamelin, D.R. "Activation of High-T_C Ferromagnetism in Mn^{2+}:ZnO using Amines." ***J.Am.Chem.Soc***, **2005**, *127*, 5292.

Bryan, J. D.; Schwartz, D. A.; Gamelin, D. R. "The Influence of Dopants on the Nucleation of Semiconductor Nanocrystals from Homogeneous Solution." ***J. Nanosci. Nanotech.,*** **2005**, *5*, 1472. (invited research article)

Bryan, J.D.; Gamelin, D.R. "Doped Semicond. Nanocrystals: Synthesis, Characterization, Phys. Properties, & Applications." ***Prog. Inorg. Chem.,*** **2005**, *54*, 47. (inv. rev.)

Patents

"Tunable Dual Emission in Doped Semiconductor Nanocrystals" Inventors: D. R. Gamelin; R. Beaulac; N. Janßen; V. A. Vlaskin, Provisional Patent Application #61/334,750, filed 5/14/2010

"Composite Photoelectrodes for Solar Water Splitting" Inventors: D. R. Gamelin; D. K. Zhong, Provisional Patent Application #61/311,724, filed 3/8/2010; International Patent Application filed 3/8/2011; Licensed by SunCatalytix, MA

VI. Grant Activity:

Awarded:		
Research Corp., Scialog (PI) *Auger de-excitationfor multi-threshold solar energy devices*	2011-2013	$250,000
NSF (PI) *Intermediate-gap colloidal doped quantum dots*	2009-2012	$440,000
NSF-CRC (PI) *Identification/control of electronically active defects in magnetic ZnO...*	2006-2012	$2,500,000
SunCatalytix (PI) *Cobalt-Catalyzed Photoelectrochemical Water Oxidation*	2010-2011	$74,830
Dreyfus Foundation, Envir. Chem. Postdoc. (PI) *Oxide tandem photoelectrochemical cells*	2008-2010	$120,000
Dreyfus Foundation, Camille Dreyfus Teacher-Scholar Award (PI)	2005-2010	$75,000
ACS-PRF Type AC (PI) *Oxide electrodes for photocatalysis/solar energy conversion*	2006-2009	$135,000
Sloan Research Fellowship	2006-2008	$45,000
NSF PECASE/CAREER (PI) *...diluted magnetic semiconductor quantum dots*	2003-2008	$550,000
Research Corp., Cottrell Scholar Award (PI) *...magnetism of doped inorganic nanocrystals*	2003-2008	$75,000
Research Corp, Research Innov. Award (PI) *...doped semiconductor quantum dots*	2002-2007	$35,000
Murdoch Foundation, Major Inst. (co-PI) *Lab. for nanomagnetics...*	2005-2006	$498,000
NSF (co-PI) *...room-temp. ferromagnetic/semicond. oxide nanostructures for spintronics...*	2002-2006	$450,000
ACS-Petroleum Research Fund (PI) *Alternative energy fellowship*	2003-2005	$100,000
NSF (co-PI) *MRI: Acquisition of scanning probe microscop...*	2003-2005	$168,000
Semicond. Res. Corp., CSR Grant (PI) *Semiconductor building blocks for nanoscale spintronics...*	2002-2005	$40,000
ACS-Petroleum Research Fund, Type G Award (PI) *El. struct./photophys. of dopants in QDs...*	2002-2005	$35,000
UW Royalty Research Fund Grant (PI) *Magneto-optical spectroscopy of magnetic materials*	2002-2004	$29,000
Pending:		
NSF (co-PI, one of five) *CEMRI-Gen. Engineered Mat. Sci. and Engin. Center-II*	2011-2017	$15,000,000
NSF (co-PI) *Solar hydrogen via metallo-macrocycle-protein photocatalysts*	2011-2014	$300,000
NSF (co-PI) *MRI: Acquisition of a dual beam focused ion beam (DB-FIB) instrument*	2011-2013	$1,119,684
In preparation:		
NSF (PI) *Composite photoelectrodes for solar fuels*	2012-2015	$350,000
DOE (PI) *Dopant-carrier interactions in doped semiconductor nanocrystals*	2012-2015	$350,000
NSF (co-PI) *Redox reactions at metal-oxide surfaces*	2012-2015	$350,000
NSF (PI) *Dual Emitting Nanoparticles*	2012-2015	$500,000

VII. Honors and Awards:

2011 Dalton Transactions Americas Lecturer, U.C. Berkeley
2009 Elected Senior Fellow of the Zukunftskolleg, University of Konstanz
2008–present, Harry and Catherine Jaynne Boand Endowed Professor in Chemistry
2008 Ornstein Colloquium Lecturer, Utrecht University
2007-08, Invited Visiting Professor, École Polytechnique Fédérale de Lausanne (EPFL), Lab for Photonics and Interfaces
2007-08, Invited Visiting Professor, University of Konstanz, Institute for Applied Photonics
2007 Cherry Emerson Lecturer, Georgia Tech, Chemistry
2006 Distinguished Teaching Award, UW, Chemistry
2006 Alfred P. Sloan Research Fellowship, Sloan Foundation
2005 Camille Dreyfus Teacher-Scholar Award, Dreyfus Foundation
2005 Dow Lecturer in Inorganic Chemistry, Caltech
2003 Presidential Early Career Award for Scientists and Engineers (PECASE)
2003 Cottrell Scholar Award, Research Corporation
2003 Faculty Early Career Development Award (CAREER), National Science Foundation
2002 Research Innovation Award, Research Corporation

VIII. Additional Comments on Research, Teaching, and Service:

Major Professional/University Service: Associate Editor, *Chemical Communications*, Royal Society of Chem. (2010-present); Editorial Advisory Board member, ACS *Inorganic Chemistry* (2009-present); Editorial Advisory Board member, ACS *Catalysis* (2010-present); Chair, Nanoscience sub-division, ACS Division of Inorg. Chem. (2006-07); Innovation Team, Advanced Materials for Energy (AME) Institute, UW (2011-present); Steering Committee, Joint Inst. of Nanoscience, UW/PNNL (2004-07); Symposium Organizer, MRS "*Photovoltaics and Optoelectronics from Nanoparticles*" (2010)

Teaching: Developed new courses in *Physical Inorganic Chemistry* and *The Inorganic Chemistry of Solar Energy Conversion*; Additional annual lectures for the Center for Nanotechnology's *Frontiers in Nanotechnology* course; Co-led submissions of two unsuccessful IGERT proposals to develop *Solar Chemistry* program, currently submitting again; Co-supervised Reed College undergraduate thesis of Dan Eichelsdorfer, Chem./Phys. (2009); Hosted visiting PhD students from Spain, Germany, the Netherlands; hosted several REU students and PUI summer faculty

Journal review: Referee for many international journals including JACS, PRL, Science, Nature, Nature sub-journals, PRB, APL

Proposal review: Referee for many international funding agencies including NSF, DOE, ACS-PRF, Res. Corp., US-CRDF, ISF

Summary of Selected Professional Activities

Name: Michael H. Gelb — Date of Revised Vitae: 6/13/2011
Rank: Professor — Date of Ph.D.: 1982 — Date of UW hire: 1985 — Date of last promotion: 1995

I. Courses Taught (only list course number & times taught):

Chem 223 (1)	Chem 232 (3)	Chem 235 (4)	Chem 238 (2)
Chem 239 (2)	Chem 241 (5)	Chem 242 (4)	Chem 336 (6)
Chem 436 (6)	Chem 533 (1)	Chem 530 (2)	Chem 531 (3)
Chem 532 (2)	Chem 540 (1)	Biochem 530 (16)	Biochem 533 (1)

II. Department and University Service:

Departmental Committees:

Search (several since 1989); Undergrad Curriculum (1987-90); Safety (1985-00); Graduate Student Education (1990-00); New Building (1990-92); Undergraduate Curriculum Reform (1995-00); Chair's Advisory (2000-present); Chemistry Library, Chair; Academic Personnel (2003-present).

College and University Committees:

Developing Undergrad Degree in Biochemistry (1986-89); Biochemistry Faculty Search (1992); Biomolecular Structure & Design Graduate Student Training Program (1995-present); Faculty Council for Research (1995-99); Candidates for Biology Program (1997); UW & FHCRC Developing proteomics for cancer diagnosis (2003-present); Co-Director, Biomolecular Structure & Design Graduate Program (2010-present)

65 Total Other Graduate Supervisory Committees: (does not include students in own group)

III. Research Group (current):

7	graduate students	8	Postdoctoral associates	18	Ph.D.s granted (career total)
8	undergraduate students	0	other Visiting Faculty		

IV. Invited Lectures: career total 218

2001 Keystone Meeting on Eicosanoids & Lipid Mediators, Snowbird, UT (Apr.); COST Meeting on Drugs Against Parasitic Disease, Lisbon, Portugal (May); Gordon Conference on Enzymes, Co-Enzymes & Metabolic Pathways, Meriden, NH (June); International Conference on Platelet Activating Factor, Tokyo, Japan (Sept.); Sequence, Structure & Function in Membrane Protein Systems, Ya'acov, Israel (Nov.).

2002 Lipids, membranes and protozoal parasites, COST-B9 Expert Meeting on Anti-protozoal Chemotherapy, Utrecht, The Netherlands (Feb.); Department of Chemistry, Massachusetts Institute of Technology, Cambridge, MA (Feb.); Keystone Conference on Drugs Against Tropical Protozoan Parasites (Mar.); Department of Pharmacology, University of Tennessee, Memphis, TN (May); Canadian Society for Chemistry National Meeting, Vancouver, BC, Canada (June); Protein Society National Meeting, La Jolla, CA (Aug.); FASEB Summer Conference on Phospholipases, Tucson, AZ (June); FASEB Summer Conference on Protein Lipidation, Tucson, AZ (July); 12^{th} International Conference on Advances in Prostaglandin, Leukotriene and Other Bioactive Lipid Research, Istanbul, Turkey (Aug.); Amgen, Inc., Thousand Oaks, CA (Aug.).

2003 Keystone Symposium on Eicosanoid Lipid Mediators: From Molecular Diversity to Clinical Application (Mar.); Medicine for Malaria Venture, Geneva, Switzerland (May); International Conference on Inborn Errors of Metabolism, Sydney, Australia (Aug.); University of Arizona, Tucson, AZ (Oct.); New England Newborn Screening Program Laboratory, Boston, MA (Dec.); Perkin-Elmer, Boston, MA (Dec.); New England Newborn Screening Program, Boston, MA (Dec.); University of Delaware, Department of Chemistry and Biochemistry, Newark, DE (Dec.).

2004 Southwestern Medical Center, University of Texas, Dallas, TX (Mar.); John Hopkins University, Malaria Research Unit, Baltimore, MD (March); University of Arizona, Tucson, AZ (May); American Society of Biochemistry and Molecular Biology National Meeting, Boston, MA (June); FASEB Summer Conference on Phospholipases, GA (July); International Conference on Phospholipase A_2 and Platelet Activating Factor, Berlin, Germany (Oct.); Meeting of the Brazilian Society of Parasitology & Meeting for Research in Chagas' Disease, Caxambu, Brazil, (Nov.).

2005 Purdue University, Department of Biochemistry (Mar.); University of California-San Francisco, Department of Pharmaceutical Chemistry (April); Society of Inborn Errors of Metabolism, Paris, France (Sept.); Genzyme, Liestal, Switzerland (Dec.); Swiss Proteomics Society, Zurich, Switzerland (Dec.); Pacifichem, Waikiki, Hawaii (Dec.).

2006 Keystone Conference on Eicosanoids, Park City, UT (Jan.); Molecular Probes, Eugene, OR (Feb.); Department of Pharmacology, Johns Hopkins University, Baltimore, MD (Mar.); Johns Hopkins University, Department of Biological Chemistry, Baltimore, MD (Mar.); ACS National Meeting, Atlanta, GA (Mar.); Cornell University, Weill Medical College, New York, NY (Apr.); 9th International Symposium on Mucopolysaccharidosis And Related Diseases, Venice, Italy (June); FASEB Summer Conference on Phospholipases, Saxtons River, VT (July).

2007 University of Victoria, Department of Chemistry, Victoria, BC, Canada (Feb.); Simon Fraser University, Department of Chemistry, Vancouver, BC, Canada (Feb.); American Society of Biochemistry and Molecular Biology Annual Meeting, Washington DC. (Apr.); International Conference on Lipid Mediators, Sorrento, Italy (May); COST Meeting on Drugs Against Parasitic Diseases, Dundee, UK (June); University of Dundee, Department of Biochemistry, Dundee, Scotland, UK (June); University of Illinois–Urbana-Champaign, Chemistry Department, Champaign-Urbana, IL (Aug.); European Molecular Biology Laboratory, Heidelberg, Germany (Nov.); Max Planck Institute for Molecular Physiology, Dortmund, Germany (Nov.); Institute for Molecular and Cellular Pharmacology, Sophia Antipolis, France (Nov.).

2008 Keystone Symposium on Eicosanoids, Big Sky, MT (Jan.); University of North Carolina, Department of Pharmacology, Chapel Hill, NC (Apr.); Seattle Biomedical Research Institute, Seattle, WA (Apr.); Symposium in Honor of Stephen G. Sligar, Seattle, WA (May); Advances in Treatment of Lysosomal Storage Diseases Conference, Halifax, NS, Canada (June); Mucopolysaccharide Disease Society International Symposium, Vancouver, BC, Canada (June); FASEB Summer Conference on Phospholipases, New Haven, CT (July); Opening Plenary Lecturer, Brazilian Medicinal Chemistry Conference, Recife, Brazil (Nov.).

2009 Keystone Symposium on Drugs Discovery for Protozoan Parasites, Breckenridge, CO (Mar.); Kaplan Lecture Series, Brandeis University, Waltham, MA (Apr.); Keystone Conference on Complex Lipids, Squaw Valley, CA (Apr.); University of Mississippi, Department of Chemistry, University, MS (Apr.); 4th International Conference on Phospholipase A_2 and Lipid Mediators, Tokyo, Japan (May); Centennial Anniversary Celebration of the Discovery of Chagas Disease, Fio Cruz, Rio de Janeiro, Brazil (July); Medicines of Malaria Venture Project Review Meeting, Singapore, Malaysia (July); Consortium for Parasitic Drug Development and Annual Meeting, St. Andrews, UK (Aug.); Department of Pharmacology, University of Georgia, Atlanta, GA (Sept.); University of Georgia, Department of Biochemistry, Athens, GA (Sept.); University of South Florida Symposium on Drug Discovery, Plenary Lecturer, Tampa, FL (Oct.); Centers for Disease Control (CDC) Conference on Newborn Screening, Atlanta, GA (Nov.).

2010 Keystone Conference on Lipid Biochemistry, Kyoto, Japan (June); Gordon Conference in Bioorganic Chemistry, Meriden, NH (June); EMBO Symposium on Chemical Biology, EMBL, Heidelberg, Germany (Sept.); GERLI Conference on Lipidomics, Anglet, France (Oct.); BrazMedChem 2010, Ouro Preto, Brazil (Nov.); Pacifichem, Honolulu, HI (Dec.).

2011 Western Washington University, Bellingham, WA (Mar.); St. Jude Children's Hospital, Memphis, TN (Apr.); NGM Biopharmaceuticals, South San Francisco, CA (Apr.); American Society of Newborn Screening and Genetic Testing, San Diego, CA (Nov.); Department of Pharmacology, Vanderbilt University (Nov.); Zing Conference on Parasite Drug Discovery, Cancun, Mexico (Dec.).

V. Publications: career total [321] in press [2] submitted [ ] book chapters, reviews [23]

Selected publications:

1. Farnsworth, C.C., Wolda, S. L., Gelb, M. H. And Glomset, J. A. (1989) "Human Lamin B contains a farnesylated cysteine residue," *J. Biol. Chem.*, 64:20422-20429.
2. Jain, M. K., Yuan, W., and Gelb, M.H. (1989) "Competitive inhibition of phospholipase A_2 in vesicles," *Biochemistry*, 28: 4135-4139.
3. Farnsworth, C. C., Gelb, M. H. and Glomset, J. A. (1990) "Identification of geranylgeranyl-modified proteins in HeLa cells," *Science*, 247:320-322.
4. Scott, D. L., White, S., Otwinowski, Z., Yuan, W., Gelb, M. H. and Sigler, P. B. (1990) "Interfacial catalysis: The mechanism of phospholipase A_2," *Science*, 250:1541-1546.

5. Yamane, H. K., Farnsworth, C. C., Xie, H., Howald, W., Fung, B. K.-K., Clarke, S., Gelb, M. H., and Glomset, J. A. (1990) "Brain G-proteins contain an all-trans-geranylgeranyl-cysteine methyl ester on their carboxyl termini," *Proc. Nat. Acad. Sci. USA*, 87:5868-5872.
6. Lin, Y., Nielsen, R., Murray, D., Hubbell, W. L., Mailer, C., Robinson, B. H., and Gelb, M. H. (1998) "Docking phospholipase A_2 on membranes using electrostatic potential-modulated spin relaxation magnetic resonance," *Science*, 279:1925-1929.
7. Gelb, M. H., Valentin, E. Ghomashchi, F., Luzdunski, M., and Lambeau, G. (2000) "Cloning and recombinant expression of structurally novel human secreted phospholipase A_2," *J. Biol. Chem.*, 275:39823-39826.
8. Buckner, F., Yokoyama, K., Lockman, J., Aikenhead, K., Ohkanda, J., Sadilek, M., Sebti, S., Van Voorhis, W., Hamilton, A., and Gelb, M. H. (2003) "A class of sterol 14-demethylase inhibitors as anti-Trypanosoma cruzi agents," *Proc. Natl. Acad. Sci. USA*, 100:15149-15153.
9. Li. Y., Scott, C. R., Chamoles, N. A., Ghavami, A., Pinto, B. M., Turecek, F., Gelb, M. H. (2004) "Direct multiplex assay of sysosomal enzymes in dried blood spots for newborn screening," *Clin. Chem.*, 50:1785-1796.
10. Henderson, W. R., Chi, E. Y., Bollinger, J. G., Tien, Y. T., Ye, X., Catelli, L., Rubtsov, Y. P., Singer, A. G., Chiang, G. K., Nevalainen, T., Rudensky, A. Y. and Gelb, M. H. (2007) "Importance of group X-secreted phospholipase A_2 in allergen-induced airway inflammation and remodeling in a mouse asthma model," *J. Exp. Med*., 204:865-877.
11. Fletcher, S., Keaney, E. P., Cummings, C. G., Blaskovich, M. A., Hast, M. A., Glenn, M. P., Chang, S.-Y., Bucher, C. J., Floyd, R. J., Katt, W. P., Gelb, M. H., Van Voorhis, W. C., Beese, L. S., Sebti, S. M., Hamilton, A. D. (2010) "Structure-based design and synthesis of potent, ethylenediamine-based, mammalian farnesyltransferase inhibitors as anticancer agents," *J. Med. Chem*., 53(19):6867-6888.
12. Shridas, P., Bailey, W. M., Gizard, F., Oslund, R. C., Gelb, M. H., Bruemmer, D., Webb, N. R. (2010) "Group X secretory phospholipase A_2 negatively regulates ABCA1 and ABCG1 expression and cholesterol efflux in macrophages," *Arterioscler Thromb Vasc Biol*., 30(10):2014-2021.
13. Bollinger, J. G., Thompson, W., Lai, Y., Oslund, R. C., Hallstrand, T. S., Sadilek, M., Turecek, F., and Gelb, M. H. (2010) "Improved sensitivity mass spectrometric detection of eicosanoids by charge reversal derivatization," *Anal. Chem.*, 82:6790-6796.
14. Zack, M., Boyanovsky, B. B., Shridas, P., Bailey, W., Forrest, K., Howatt, D. A., Gelb, M. H., de Beer, F. C., Daugherty, A., Webb, N. R. (2010) "Group X secretory phospholipase A_2 augments angiotension II-induced inflammatory responses and abdominal aortic aneurysm formation in apoE-deficient mice," *Atherosclerosis*, 214:58-64.
15. Duffey, T. A., Sadilek, M., Scott, C. R., Turecek, F., and Gelb, M. H. (2010) "Tandem mass spectrometry for the direct assay of lysosomal enzymes in dried blood spots: Application to screening newborns for Mucopolysaccharidosis IV (Maroteaux-Lamy Syndrom)", *Anal. Chem*. 82:9587-9591.
16. Lai, Y., Oslund, R. C., Bollinger, J. G., Henderson, W. R. Jr., Santana, L. F., Altemeier, W. A., Gelb, M. H., Hallstrand, T. S. (2010) "Eosinophil cysteinyl leukotriene synthesis mediated by exogenous secreted phospholipase A_2 group X," *J. Biol. Chem.*, 285(53):41491-41500.
17. Boilard, E., Lai, Y., Larabee, K., Balestrieri, B., Ghomashchi, F., Fujioka, D., Gobezie, R., Coblyn, J. S., Weinblatt, M. E., Massarotti, E. M., Thornhill, T. S., Divangahi, M., Remold, H., Lambeau, G., Gelb, M. H., Arm, J. P., Lee, D. M. (2010) "A novel anti-inflammatory role for secretory phospholipase A_2 in immune complex-mediated arthritis," *EMBO Mol. Med.*, 2(5):172-187.
18. Shridas, P., Bailey, W. M., Boyanovsky, B. B., Oslund, R. C., Gelb, M. H., Webb, N. R. (2010) "Group X secretory phospholipase A_2 regulates the expression of steroidogenic acute regulatory protein (StAR) in mouse adrenal glands," *J. Biol. Chem.*, 285(26):20031-20039.
19. Duffey, T. A., Bellamy, G., Elliott, S., Fox, A. C., Glass, M., Turecek, F., Gelb, M. H., Scott, C. R. (2010) "A tandem mass spectrometry triplex assay for the detection of Fabry, Pompe, and Mucopolysaccharidosis-I (Hurler)," *Clin. Chem.*, 56(12):1854-1861.
20. Duffey, T. A., Khaliq, T., Scott, C. R., Turecek, F., Gelb, M. H. (2010) "Design and synthesis of substrates for newborn screening of Maroteaux-Lamy and Morquio A syndromes," *Bioorg. Med. Chem. Lett.*, 20(20):5994-5996.

21. Ghomashchi, F., Naika, G. S., Bollinger, J. G., Aloulou, A., Lehr, M., Leslie, C. C., Gelb, M H. (2010) "Interfacial kinetic and binding properties of mammalian group IVB phospholipase A_2 ($cPLA_2\beta$) and comparison with the other $cPLA_2$ isoforms," *J. Biol. Chem.*, 285(46):36100-36111.
22. Whitty, A., Gleb, M. H. (2010) "Critical challenges and emerging paradigms in drug discovery," *Curr. Opin. Chem. Biol.*, 14(4):437-439.
23. Khaliq, T. Sadilek, M., Scott, C. R., Turecek, F., Gelb, M. H. (2011) "Tandem mass spectrometry for the direct assay of Lysosomal enzymes in dried blood spots: Application to screening newborns for Mucopolysaccharidosis IVA," *Clin. Chem.*, 57(1):128-131.
24. Crowther, G. J. Napuli, A. J., Gilligan, J. H., Gagaring, K., Borboa, R., Francek, C., Chen, Z., Dagostino, E. F., Stockmyer, J. B., Wang, Y., Rodenbough, P. P., Castaneda, L. J., Leibly, D. J., Bhandari, J., Gelb, M. H., Brinker, A., Engels, I. H., Taylor, J., Chatterjee, A. K., Fantauzzi, P., Glynne, R. J., Van Voorhis, W. C., Kuhen, K. L. (2011) "Identification of inhibitors for putative malaria drug targets among novel antimalarial compounds," *Mol. Biochem Parasitol.*, 175:21-29.
25. Bryant, K. J., Bidgood, M. J., Lei, P. W., Taberner, M., Salom, C., Kumar, V., Lee, L., Church, W. B., Courtenay, B., Smart, B. P., Gelb, M. H., Cahill, M. A., Graham, G. G., McNeil, H. P., Scott, K. F. (2011) "A bifunctional role for group IIA secreted phospholipase A_2 in human rheumatoid fibroblast-like synoviocyte arachidonic acid metabolism," *J. Biol. Chem.*, 286:2492-2503.
26. Wolfe, B. J., Blanchard, S., Sadilek, M., Scott, C. R., Turecek, F., Gelb, M. H. (2011) "Tandem mass spectrometry for the direct assay of Lysosomal enzymes in dried blood spots: Application to screening newborns for Mucopolysaccharidosis II (Hunter Syndrome)," *Anal. Chem.*, 83:1152-1156.

VI. Grant Activity:

NIH Consortium for Parasite Drug Development (ends 11/11) Developing Drugs to Treat African Sleeping Sickness
NIH R01 (ends 4/13) Regulation and function of cytosolic phospholipase A_2 (PI: M. Gelb)
NIH R01 (ends 6/13) Biochemistry of protein prenylation (PI: M. Gelb)
NIH R01 (ends 8/13) Multiplex analysis of inborn errors of metabolism (Co-PI w/ F. Turecek)
NIH R01 (ends 4/16) Development of Anti-Chagas Disease Drugs (Co-PI w/F. Buckner)
NIH R37 Merit Award (ends 2/17) Biochemical studies of 14-kDa phospholipases A_2 (PI: M. Gelb)
Drugs for Neglected Disease Initiative (starts 9/08) Development of sterol biosynthesis inhibitors as anti-Chagas drugs (Co-PI w/ F. Buckner)
Partial summer salary and PhD student support from 3 other NIH grants in which Gelb's role is a collaborator.

VII. Honors and Awards:

Medicines for Malaria Venture Project of the Year (2003)
NIH Merit Award (2007)
Harry and Catherine Jaynne Boand Endowed Professor of Chemistry (2008-present)
Fellow of the American Association for the Advancement of Science (elected in 2010)

VIII. Additional Comments on Research, Teaching, and Service:

1. My teaching ratings for honors organic chemistry (CHEM 336, Winter 2008 and 2009) are in the 4.3-4.7 range for all categories, the highest I have every obtained at UW.
2. Newborn screening assays developed by the Gelb and Turecek groups are now in use in states of New York, Illinois, and Missouri, and also in Austria and Taiwan for the screening of several lysosomal storage diseases.
3. We are very excited about a new series of enzyme inhibitors developed by the Gelb and Buckner groups at UW for the treatment of Chagas disease. Our lead compound is being advanced by the Drugs for Neglected Diseases Initiative (Geneva) for transition into clinical trials. Chagas disease affects millions of people in Latin America. There is currently no treatment, and the disease is usually fatal.
4. We are very excited about our recent data with phospholipase A_2 knockout mice. In studies in collaboration with Prof. W. Henderson in the UW Medical School, we have shown that group X PLA_2 plays a critical role in a mouse model of asthma (published in *J. Exp. Med.*). In collaboration with Prof. D. Lee, Harvard Medical School we have shown that group IIA PLA_2 plays a critical role in a mouse model of rheumatoid arthritis (submitted to Nat. Med.).
5. During Summer 2011, I will prepare an NIH Training Grant proposal in Chemical Biology with the help of D. Maly and C. Chatterjee (Gelb, PI).

Summary of Selected Professional Activities

Name: David S. Ginger, Jr. Date of Revised Vitae: 6/10/11
Rank: Professor Date of Ph.D.: 2001 Date of UW hire: 7/15/03 Date of last promotion: 9/10

I. Courses Taught (only list course number & times taught):

CHEM 155 (honors) (4)
CHEM 399 (undergrad research)
CHEM 455 (quantum) (5)
CHEM 475 (honors quantum) (8)
CHEM 550 (Grad quantum) (5)
CHEM 560 (student nanotech seminar) (4)
CHEM 595 (pchem seminars) (5)
CHEM 561 (nanotech seminar) (1)

II. Department and University Service:

Department Committees: Chair, Graduate Applications & Recruiting (Open House) 2003-07, chair 2006-07; Physical Chemistry Faculty Search Chair 2007-08; Solar/Other Faculty Search co-chair, 2008-09, 2009-10, 2010-11 Physical Chemistry 2nd year exams, 2005, chair, 2008; Materials Track Advising 2005-present

College/University Committees: Mat. Sci. & Eng. Faculty Search (2006), U.K. & Ireland Scholarships (2004-present), Faculty coordinator, NNIN REU program (2004-07, 2011), Instructor for the Nanoscale Undergraduate Education Scanning Probe Workshop NUE UNIQUE, June 2007 & 2008, Advisor to Mat. Sci. & Eng. Kyocera Chair Faculty Search (2010-11), Advisor to Elec. Eng. Molecular Eng. Search (2010-11)

47 Total Other Graduate Supervisory Committees: (does not include students in own group)

III. Research Group (current):

7 graduate students
6 Postdoctoral associates
8 Ph.D.s granted (career total)
4 undergraduate students
1 other Visiting Faculty

IV. Invited Lectures: career total 97+

2011

Organic/Hybrid Materials for Photonics & Energy Workshop, Wuhan, China, Oct. 17-21
Res. Corp. Scialog Solar Conference, AZ, Oct. 12-14
Thin Film Solar Workshop, Santa Barbara, CA Aug.8-11
ICMAT2011 Singapore, June 26-July 1
IEEE Photovoltaics Specialists Conference, June 20
DOE EFRC Summit and Forum, May 25-27
Emerg. Opp. in Nano. Semicond., Northwestern June 3
Center For Probing the Nanoscale, Stanford, CA May 14
European-Mat. Res. Society, Nice, France, May 13-19
Materials Res. Society, San Francisco, CA, April 25-29
American Chemical Society, Anaheim, CA, March 27-32
American Physical Society, Dallas, TX, March 20-24

2010

Materials Research Society, Boston, MA, Nov. 29-Dec. 3
IEEE Photonics Society, Denver, CO, Nov. 7-11
SPMEA, Keynote Speaker, Oak Ridge, TN Sept. 15-17
US-Korea Conf. on Sci & Tech, E &E, Seattle, WA 8/11-15
Gordon Conf. (disc leader), Mt. Holyoke Col., 7/25-30
MRS Org. Microelec. & Optoelec. W/S, San Francisco 7/6
Norwestern University, PChem Sem., Chicago, IL June 2
MRS, San Francisco, CA, April 5-9
ACS, San Francisco, CA, March 21-25
Vanderbilt Institute for Nanosci Coll., Nashville, TN, 2/24
Tech. Univ. of Eindhoven, Netherlands, January 18

2009

Materials Research Society, Boston, MA, Nov. 30-Dec. 6
American Vacuum Society, San Jose, CA, Nov. 9-13
Molecular Foundry, LBL, Berkeley, CA, Oct. 16
Am. Assoc. of Physics Teachers WA Sec, Ellensburg 10/10
Micro-Nano Breakthrough Conf., Sept. 21-23
Johns Hopkins Univ., MSE, Sept. 16
Rice University, Aug. 23-26
ICMAT2009, Singapore, June 28-July 3
Molecular Plasmonics 2009, Jena, Germany, May 14-16
Indiana University, Chemistry May 5
University of Texas at Austin, April 24
UC Berkeley Nanoscience & Nanoengineering Inst., Apr. 3.
Cornell Center for Nanoscale Systems, Ithaca, NY, April 1.
ACS Spring Meeting, Salt Lake City, UT, March
University of Utah, Physics Colloquium, Feb. 5

2008 (partial list)

Georgia Tech, Feb. 28
Univ. of Minnesota, Dept. of Chemistry Seminar, Apr. 3
Spring ACS Meeting New Orleans, LA, Apr. 6-9
Univ. of Montreal, Physics Colloquium, Montreal, Apr. 13
University of Michigan, MSE Ann Arbor, MI, Apr. 10
University of California Riverside, May 5
University of Pittsburgh, May 15
ACS Colloid & Surface Sci. Award Sym., Raleigh, NC, Jun. 17
Int'l Conf. on Nanosci. & Tech., Keystone, CO, Jul. 21-5
ACS Fall Meeting, Philadelphia, PA, Aug. 17
APCTP-ASEAN Adv. Mat. Workshop, Nha Trang, Vietnam, Sept. 15
Purdue University, Dept.of Chemistry Seminar, Oct. 31
Reed College, Portland, OR, Oct. 11

V. Publications: career total 81 in press 1 submitted 2 book chapters, reviews 5

As of June 9, 2011: Career Citations 3000+, H-factor: 25, Citations from UW work: 1000+

Selected pubs listed:

81. "Spatially Modulating Interfacial Properties of Transparent Conductive Oxides: Patterning Work Function with Phosphonic Acid SAMs" Kristina M. Knesting, Peter J. Hotchkiss, Bradley A. MacLeod, Seth R. Marder, and David S. Ginger, Advanced Materials, to be submitted (2011)
80. "Optical Detection of Protein in Complex Media with Plasmonic Nanoparticle Dimers" J. I. L. Chen, H. Durkee, B. Traxler, D. S. Ginger, Small, (accepted), (2011)
79. "Quantum Dot/Plasmonic Nanoparticle Metachromophores with Quantum Yields That Vary with Excitation Wavelength" K. Munechika, Y. Chen, A. Tillack, A. P. Kulkarni, I. Jen-La Plante, A. M. Munro, Nano Letters, DOI: 10.1021/nl2010127 (2011)
78. "Surface Characterization of Polythiophene:Fullerene Blends on Different Electrodes using Near Edge X-ray Absorption Fine Structure", Andreas F. Tillack, Kevin M. Noone, Bradley A. MacLeod, Dennis Nordlund, Kenneth P. Nagle, Joseph P. Bradley, Steven K. Hau, Hin-Lap Yip, Alex K.-Y. Jen, Gerald T. Seidler, David. S. Ginger ACS Applied Materials and Interfaces 3 (3) pp 726-732 (2011)
77. "Controlling Vertical Morphology within the Active Layer of Organic Photovoltaics Using Poly(3-hexylthiophene) Nanowires and Phenyl-C61-butyric Acid Methyl Ester", Andrew H. Rice, Rajiv Giridharagopal, Sam X. Zheng, Fumio S. Ohuchi, David S. Ginger, and Christine K. Luscombe ACS Nano 5(4) pp 3132-3140 (2011)
76. "Imaging Local Trap Formation in Conjugated Polymer Solar Cells: A Comparison of Time-Resolved Electrostatic Force Microscopy and Scanning Kelvin Probe Imaging", Obadiah G. Reid, Glennis E. Rayermann, David C. Coffey, and David S. Ginger J. Phys. Chem. C 114 (48) pp20672-20677 (2010).
75. "Nanostructure Determines the Intensity Dependence of Open Circuit Voltage in Plastic Solar Cells," O. G. Reid, H. Xin, S. A. Jenekhe, D. S. Ginger, J. Appl. Phys. 108 (8) 084320 (2010) (2010).
74. "Plasmonic Nanoparticle Dimers for Optical Sensing of DNA in Complex Media," J. I. L. Chen, Y. Chen, D. S. Ginger, J. Am. Chem. Soc., 132, 9600 (2010).
73. "Broadband Absorbing Bulk Heterojunction Photovoltaics Using Low-Bandgap Solution-Processed Quantum Dots," K. M. Noone, E. Strein, N. C. Anderson, P. T. Wu, S. A. Jenekhe, D. S. Ginger, Nano Lett. 10, 2635-2639 (2010)
72. "Cooperative Near-Field Surface Plasmon Enhanced Quantum Dot Nanoarrays," K. Leong, Y. Chen, D. J. Masiello, M. T. Zin, M. Hnilova, H. Ma, C. Tamerler, M. Sarikaya, D. S. Ginger, A. K.-Y. Jen, Adv. Funct. Mater. 20, 2675 (2010).
71. "Concerted Emission and Local Potentiometry of Light-emitting Electrochemical Cells", D. B. Rodovsky, O. G. Reid, L. S. C. Pingree, D. S. Ginger, 4 (5) pp2673-2680, (2010).
70. "Characterizing Morphology in Bulk Heterojunction Organic Photovoltaic Systems" R. Giridharagopal, D. S. Ginger, invited perspective in. J. Phys. Chem. Letters, 1 (7) pp1160-1169 (2010).
69. "Spectral Control of Plasmonic Emission Enhancement from Quantum Dots near Single Silver Nanoprisms" K. Munechika, Y. Chen, A. Tillack, A. Kulkarni, I. Jen-La Plante, A. M. Munro, D. S. Ginger, Nano Letters, 10, 2598-2603 (2010).
68. "Plasmon-Enhanced Charge Carrier Generation in Organic Photovoltaic Films Using Silver Nanoprisms" A. P. Kulkarni, K. M. Noone, K. Munechika, S. R. Guyer, D. S. Ginger, Nano Letters, 1 (7) pp1501-1505 (2010).
67. "Polymer Nanowire/Fullerene Bulk Heterojunction Solar Cells: How Nanostructure Determines Photovoltaic Properties", H. Xin, O.G. Reid, D. S. Ginger, S. A. Jenekhe, ACS Nano 4 (4) 1861-1872 (2010).
66. "Heterogeneity in Polymer Solar Cells: Local Morphology and Performance in Organic Photovoltaics Studied with Scanning Probe Microscopy", Chris Groves, Obadiah G. Reid, David S. Ginger, (invited) Accounts of Chemical Research, 43 (5) pp612-620 (2010).
65. "Importance of Spectra Overlap: Fluorescence Enhancement by Single Metal Nanoparticles", Keiko Munechika, Yeechi Chen, Jessica M. Smith, David S. Ginger, in Metal Enhanced Fluorescence, C. D. Geddes, Ed. (Wiley), 2010.
64. "Imaging the evolution of nanoscale photocurrent collection and transport networks during annealing of polythiophene/fullerene solar cells", Liam S. C. Pingree, Obadiah G. Reid, David S. Ginger", Nano Letters, 9, 2946 (2009).
63. "Phase Transfer of Large Anisotropic Plasmon Resonant Silver Nanoparticles from Aqueous to Organic Solution", Abhishek P. Kulkarni, Keiko Munechika, Kevin M. Noone, Jessica M. Smith, David S. Ginger, Langmuir 25, 7932 (2009).
62. "Absence of Long-Lived Photoinduced Charge Transfer in Blends of PbSe Quantum Dots and Conjugated Polymers" K. M. Noone, A. M. Munro, N. C. Anderson, N. Horwitz, A. P. Kulkarni and D. S. Ginger, ACS Nano, 3, 1351, (2009).
61. "Doping for Speed: Colloidal Nanoparticles for Thin-Film Optoelectronics" K. M. Noone and D. S. Ginger, ACS Nano, 3, 261 (2009).

60. "Nanopatterning Peptides as Bi-Functional Inks for Templated Assembly", J. H. Wei, T. Kacar, C. Tamerler, M. Sarikaya, D. S. Ginger, Small 5, 689 (2009).
59. "The Role of Mesoscopic PCBM Crystallites in Solvent Vapor Annealed Copolymer Solar Cells" T.A. Bull, L. S. C. Pingree, S. A. Jenekhe, D. S. Ginger, C. K. Luscombe, ACS Nano, 3, 627,(2009).
58. "Electrical Scanning Probe Microscopy on Active Organic Electronic Devices," L. S. C. Pingree, O. G. Reid, D. S. Ginger, Adv. Mater. 21, 19 (2009).
57. "Controlling Film Morphology in Conjugated Polymer:Fullerene Blends with Surface Patterning," L. Y. Park, A. M. Munro, D. S. Ginger, J. Am. Chem. Soc. 130, 15916 (2008).
56. "Excitation Enhancement of CdSe Quantum Dots by Single Metal Nanoparticles", Y. Chen, K. Munechika, I. Jen-La Plante, A. M. Munro, S. E. Skrabalak, Y. Xia, D. S. Ginger, Appl. Phys. Lett. 93, 053106 (2008).
55. "Photoluminescence Quenching of Single CdSe Nanocrystals by Ligand Adsorption," A. M. Munro, D. S. Ginger, Nano Letters 8, 2585-2590, (2008).
54. "Bioenabled Nanophotonics" Y. Chen, K. Munechika, D. S. Ginger, MRS Bulletin, invited review, 33, 536-542 (2008).
53. "Space Charge Limited Current Measurements on Conjugated Polymer Films using Conductive Atomic Force Microscopy," O. G. Reid, K. Munechika, D. S. Ginger, Nano Letters, 8, 1602-1609, (2008).
52. "The changing face of PEDOT:PSS films: substrate, bias, and processing effects on vertical charge transport" L. S. C. Pingree, B. A. MacLeod, D. S. Ginger, J. Phys. Chem. C., 112, 7922-7927, (2008).
51. "Electroluminescence from Colloidal CdSe Quantum Dots: Ligand Effects and Light-Emitting Diodes," A. M. Munro, J. A. Bardecker, M. S. Liu, Y.-J. Cheng, Y. Niu, I. J.-L. Plante, A. K.-Y. Jen, D. S. Ginger, Microchimica Acta, 160, 345-350 (2008).
50. "Scanning Kelvin Probe Imaging of the Potential Profiles in Fixed and Dynamic Planar LECs," L. S. C. Pingree, D. B. Rodovsky, D. C. Coffey, G. P. Bartholomew, D. S. Ginger, J. Am. Chem. Soc., 129, 15903-15910 (2007)
49. "Plasmon Linewidths of Single Silver Nanoprisms as a Function of Particle Size and Plasmon Peak Position," K. Munechika, J. M. Smith, Y. Chen, D. S. Ginger, J. Phys. Chem. C 111, 18906-18911 (2007).
48. "A Direct-Write Single Step Positive Etch Resist for Dip-Pen Nanolithography," J. H. Wei and D. S. Ginger, Small, 3, 2034-2037 (2007).
47. "Improved performance from multilayer quantum-dot light-emitting diodes via thermal annealing of the quantum-dot layer," Y. Niu, A. M. Munro, Y.-J. Cheng, Y. Tian, M. S. Liu, J. Zhao, J. A. Bardecker, I. J.-L. Plante, D. S. Ginger, A. K.-Y. Jen, Adv. Mater, 19, 3371-3376 (2007).
46. "Synthesis and Optical Properties of Silver Nanobars," B. J. Wiley, Y. Chen, J. McLellan, Y. Xiong, Z.-Y. Li, D. S. Ginger, Y. Xia, Nano Letters, 7, 1032-1036 (2007).
45. "Quantitative Study of the Effects of Surface Ligand Concentration on CdSe Nanocrystal Photoluminescence," A. M. Munro, I. J.-L. Plante, M. S. Ng, D. S. Ginger, J. Phys. Chem. C, 111, 6220 - 6227 (2007).
44. "Mapping Local Photocurrents in Polymer/Fullerene Solar Cells with Photoconductive Atomic Force Microscopy," D. C. Coffey, O. G. Reid, D. B. Rodovsky, G. T. Bartholomew, D. S. Ginger, Nano Letters, 7, 738-744 (2007).
43. "Dependence of fluorescence intensity on the spectral overlap between fluorphores and plasmon resonant single silver nanoparticles," Y. Chen, K. Munechika, D. S. Ginger, Nano Letters, 7, 690-696 (2007).
42. "Peptide-Mediated Formation of Surface-Immobilized Quantum Dot Hybrid Nanoassemblies with Controlled Photoluminescence Properties," M. T. Zin, A. M. Munro, M. Gungormus, H. Ma, C. Tamerler, D. S. Ginger, M. Sarikaya, A. K.-Y. Jen, J. Mater. Chem. 17, 866 (2007).
41. "Nucleating pattern formation in spin-coated polymer blend films with nanoscale surface templates," J. H. Wei, D. C. Coffey, D. S. Ginger, J. Phys. Chem. B 110, 24324 (2006).
40. "Time-Resolved Electrostatic Force Microscopy of Polymer Solar Cells," D. C. Coffey, D. S. Ginger, Nature Materials 5, 735-740, (2006).
39. "Efficient CdSe/CdS Quantum Dot Light-Emitting Diodes Using a Thermally Polymerized Hole Transport Layer," J. Zhao, J. A. Bardecker, A. M. Munro, M. S. liu, Y. Niu, I.-K. Ding, J. Luo, B. Chen, A. K.-Y. Jen, D. S. Ginger, Nano Letters 6, 463 (2006).
38. "Patterning Phase Separation in Polymer Films with Dip-Pen Nanolithography," D. C. Coffey, D. S. Ginger, J. Am. Chem. Soc. 127, 4564 (2005).
37. "DPN-Generated Nanostructures as Positive Resists For Preparing Lithographic Masters or Hole Arrays," K. Salaita, S. W. Lee, D. S. Ginger, C. A. Mirkin, Nano Letters, 6, 2493, (2006)
36. "Top-Down Meets Bottom-Up: Dip-Pen Nanolithography and DNA-Directed Assembly of Nanoscale Electrical Circuits," S. W. Chung, D. S. Ginger, M. Morales, Z. Zhang, V. Chandrasekhar, M. A. Ratner, C. A. Mirkin, Small 1, 64 (2005).
35. "Nanoarrays," D. V. Nicolau, L. M. Demers, D. S. Ginger, in Microarray Technology and Its Applications U. R. Muller, D. V. Nicolau, Eds. (Springer, Berlin, 2005) 89-118.
34. "The evolution of dip-pen nanolithography," D. S. Ginger, H. Zhang, C. A. Mirkin, Angew. Chem. Int. Ed. 43, 30 (2004).

33. "Direct-write dip-pen nanolithography of proteins on modified silicon oxide surfaces," J. H. Lim, D. S. Ginger, K. B. Lee, J. Heo, J. M. Nam, C. A. Mirkin, Angew. Chem. Int. Ed. 42, 2309 (2003).
32. "Living templates for the hierarchical assembly of gold nanoparticles," Z. Li, S. W. Chung, J. M. Nam, D. S. Ginger, C. A. Mirkin, Angew. Chem. Int. Ed. 42, 2306 (2003).
31. "Electrical properties of semiconductor nanocrystals," D. S. Ginger, N. C. Greenham, in Semiconductor and Metal Nanocrystals V. I. Klimov, Ed. (Marcel Dekker, New York, 2003).
30. "Next-Generation Biosensing with Gold Nanoparticles," D. S. Ginger, Y. C. Cao, C. A. Mirkin, Biophotonics International 10, 48 (2003).

VI. Grant Activity:

Total funds awarded since 2003: ~$6.8M (total costs, Ginger share only)

Current:		
Research Corp Scialog (co-PI w/ D. Gamelin) … *multi-threshold solar energy conversion devices*	2010-2013	$125,000
NSF (PI) *Role of Heterogeneity in Organic Semiconductor Performance*	2010-2013	$360,000
AFOSR (PI) *Discrete Photoswitchable Nucleic-Acid Nanoaggregates for Remote Sensing*	2010-2013	$485,000
ONR (co-PI w/ A. Jen) *Novel …Side-Chain Polymers for Improved Bulk-Heterojunction Performance*	2011-2014	$390,000
NSF (member) *MRSEC- Genetically Engineered Materials Science and Engineering Center*	2005-2011	$375,000
Camille and Henry Dreyfus Foundation (PI) *Dreyfus Teacher-Scholar Award*	2007-2012	$75,000
NSF (co-PI w/ D. Schwartz, K. Bohringer, F. Baneyx) *NIRT: Protein Aided Nanomanufacturing*	2007-2012	$280,000
DOE (co-PI w/ A. Jen, C. Luscombe, J. Rehr, Ma) *Interfacial Engineering for…Photovoltaic Devices*	2008-2011	$180,000
NSF *NSF STC: Materials and Devices for Information Technology Research*	2008-2010	$140,000
DOE *Center for Interface Science: Hybrid Solar-electric Materials*	2009-2014	$430,000
DOE BES (co-PI w/ S. Jenekhe) *Molecular and Nanoscale Engineering of High…Solar Cells*	2010-2013	$300,000
Pending:		
NSF (IRG Lead) *CEMRI - Genetically Engineered Materials Science and Engineering Center*	2011-2016	$550,000
W.M. Keck Foundation (PI) *Fast Probes of Nanoscale Charge and Spin Dynamics*	2011-2013	$450,000
NSF (coPI) SOLAR: Solving the Organic Solar Cell Morphology Bottleneck	2011-2014	$434,000
Past:		
NSF (PI) *CAREER: Understanding Morphology-Property Correlations in Conjugated PolymerFilms with Nanoscale Optoelectronic Probes*	2005-2010	$798,465
AFOSR (PI) *PECASE: Biological and Interfacial Templates for Nanophotonic Applications*	2005-2010	$500,000
ONR (co-PI w/ Jen & Dunham) *Enhanced Performance of Polymer Photovoltaics via Optical…Eng.*	2008-2010	$200,000
AFOSR Equipment Supplement *Acquisition of an Atomic Force Microscope for Bioinspired Materials*	2009-2010	$200,000
DOE (co-PI w/ S. Jenekhe, G. Cao) *Molecular…Solar Cells*	2007-2010	$285,000
Murdock Found *Acquisition of Inert Atmosphere…* (award includes UW match)	2008-2010	$900,000
Alfred P. Sloan Foundation (PI) *Sloan Research Fellowship*	2007-2009	$45,000
AFOSR (author/co-PI w/ Jen, Dalton) *DURIP: Drybox Thermal Evaporator Sys. for Org. Optoelectr.*	2007-2008	$237,000
Research Corporation (PI) *Research Corporation Cottrell Scholar Award*	2006-2008	$100,000
NSF STC (PI) *Seed: Optoelectronic Properties of Single CdSe Quantum Dots*	2005-2008	$100,000
ACS Petroleum Research Fund (PI) *Biofunctionalized Nanoparticle Superlattices*	2005-2007	$35,000
AFOSR (co-PI) *Bioinspired Multi-component Nanostructured …for Efficient Photovoltaic Cells*	2005-2007	$135,000
NSF NER *Dip-Pen …Templates for Conjugated Polymer Photovoltaic Devices*	2004-2005	$129,000

VII. Honors and Awards:

2005 NSF Career Award
2005 PECASE (Presidential Early Career Award for Scientists and Engineers) AFOSR
2006 Research Corporation Cottrell Scholar
2007 Sloan Fellowship
2007 Dreyfus Teacher-Scholar Award
2007 Departmental Outstanding Teaching Award, University of Washington
2008 American Chemical Society Unilever Award
2010 Lawton Distinguished Scholar in Chemistry, University of Washington
2012-2013 Defense Sciences Study Group, Institute for Defense Analysis

---

VIII. Additional Comments on Research, Teaching, and Service:

In addition to the listed service activities, I have been happy to have the chance to give a large number of lectures at the department, university, and regional level addressing the research challenges and opportunities in solar energy, as well as to have been featured in the UW Energy Futures web video.

Summary of Selected Professional Activities

Name: Karen I Goldberg — Date of Revised Vitae: 6/2011
Rank: Professor — Date of Ph.D.: 1988 — Date of UW hire: 1995 — Date of last promotion: 9/2003

I. Courses Taught (all multiple times):

Chem 317 (Advanced Inorganic Lab) Chem 510 (Current Prob. In Inorg. Chem)
Chem 399/499 (Undergrad Research) Chem 591 (Inorganic Seminars) Chem 800 (Doctoral Dissertation)
Chem 417 (Organometallic Chemistry) Chem 600 (Independent Research)

II. Department and University Service:

Departmental Committees Undergraduate Curriculum (1995-97, 1998-99, 2008-11); Faculty Search Subcommittee (1995-96, 1998-99, 2010-11); Graduate Advising/Orientation (1996-2000); Graduate Recruiting Weekend (1996-2003); Graduate Admissions (1999-2001); Graduate Applications/Recruiting (1999-2002, Chair); Strategic Planning (1999-2001); Undergraduate Education 100-400 Level Labs (2001-04); Academic Personnel (2003-04, 2005-11); Chair's Advisory (2003-04, 2005-11); Research Services (2005-08)

College and University Committees: Panel Discussion Participant in Winter Quarterly Workshop for Faculty Fellows "Preparing Teaching Materials for Promotion and Tenure" (2/01); Panel Discussion Participant in "Balancing Parenting & a Career in Science" Sponsored by Catalyst Committee, Chemistry Graduate Student Club (4/03); University Committee responsible for the curriculum for new student orientation faculty led seminars (2003); Atmospheric Sciences Chair Search (2007); Speaker at UW Advance Program "Mentoring-for-Leadership Lunch" (2009); University Panel to Select Top Ph.D. Dissertation (2010)

~45 Total Other Graduate Supervisory Committees: (does not include students in own group)

III. Research Group (current):

7	graduate students	3	Postdoctoral associates	12	Ph.D.s granted (career total)
2	undergraduate students	1	other Visiting grad student		

IV. Invited Lectures: career total 127

Conferences **2001**: Florida Catalysis Conference, Palm Coast, FL (4/01); "Homogeneous Catalysis in the Petroleum and Petrochemical Industry" Symposium, 222nd National Meeting of the American Chemical Society, Chicago, IL (8/01). **2002:** "Activation and Functionalization of C-H Bonds" Symposium at the 223rd ACS National Meeting, Orlando, Fl (4/02); National Laboratory Catalysis Conference (NLCat), Richland, WA (5/02); "Organometallic Chemistry: From Mechanisms to Applications in Synthesis and Catalysis" (Symposium in honor of Prof. Robert G. Bergman's 60th Birthday), Berkeley, CA (6/02); "Frontiers of Transition Metal Organometallic Chemistry" Symposium, 85th Canadian Society for Chemistry Conference, Vancouver, BC, Canada (6/02); Inorganic Chemistry Gordon Conference, Newport, RI (7/02); Department of Energy, Basic Energy Sciences Workshop on Directions in Homogeneous Catalysis, Keynote Speaker, Chicago, IL (9/02). **2003:** "Symposium to Honor Professors Richard Eisenberg and William Jones," 225th ACS National Meeting, New Orleans, LA (3/03). **2004**: Reaction Mechanisms Conference, Chicago, IL (6/04), Organometallic Gordon Conference, Newport, RI (7/04); International Conference on Organometallic Chemistry, Vancouver, BC, Canada (7/04). **2005**: "Mechanistic Organometallic Chemistry" Symposium, 88th Canadian Society for Chemistry Conference, Saskatoon, Canada (6/05); "Chemistry of b-diketiminate complexes" Symposium, 230th ACS National Meeting, Washington, D.C. (8/05); "Syntheses and Mechanism in Late Transition Metal Organometallics" Symposium, International Chemical Congress of Pacific Basin Societies (Pacifichem), Honolulu, HI (12/05); "Homogeneous Catalytic CH Activation and Functionalization" Symposium, International Chemical Congress of Pacific Basin Societies (Pacifichem), Honolulu, HI (12/05). **2006:** "Reactions of Late Transition Metal Organometallic Complexes with Molecular Oxygen" National Science Foundation Workshop, Blaine, WA (6/06); "Mechanistic Studies of Organometallic Reactions Relevant to the Selective Oxidation of Alkanes" 2nd Erlangen SFB Symposium on Redoxactive Metal Complexes, Erlangen, Germany (10/06). **2007**: "Organometallic Reactions Relevant to Selective Hydrocarbon Oxidation" Renewable Energy: Solar Fuels Gordon Conference, Ventura, CA (1/07). **2008**: DOE Hydrogen Program Merit Review and Peer Evaluation Meeting, Washington, DC (6/08), Gordon Conference on Green Chemistry, Lewiston, ME (8/08); 3rd Annual NEDO/AIST/LANL Workshop on Hydrogen Storage and Fuels Cells in San Diego, CA (9/08). **2009**: Inorganic Reaction Mechanisms Gordon Conference, Ventura, CA (3/09); *Plenary Lecturer,* XVIII EuCheMS Conference on Organometallic Chemistry, Gothenburg, Sweden (6/09); Organometallic Chemistry Gordon Conference, Providence, RI (7/09). **2010**: "Green Chemistry for a Sustainable World" Symposium, 239th ACS

National Meeting, San Francisco, CA (3/10): "New Frontiers in Organometallic Chemistry" Symposium in honor of the 2010 Stauffer Lecturer, Robert Crabtree, University of Southern California, Los Angeles, CA (4/10); "Symposium in Honor of Dick Puddephatt," 93rd Canadian Chemistry Conference, Toronto, Canada (5/10); "Advances in Metal-Mediated Bond Activation: From Unusual Bonding Motifs to Applications in Catalysis" Symposium, International Chemical Congress of Pacific Basin Societies (Pacifichem), Honolulu, HI (12/10) (*cancelled due to death in the family)*; "Dioxygen Activation Chemistry and Catalytic Oxidation Reactions" Symposium, International Chemical Congress of Pacific Basin Societies, (Pacifichem), Honolulu, HI (12/10) (*cancelled due to death in the family).* **2011**: 5th Annual QAFCO-TAMUQ (Texas A&M University at Qatar) Chemistry Conference, Doha, Qatar (1/11); "ACS for Distinguished Service in the Advancement of Inorganic Chemistry: Symposium in Honor of Charles P. Casey," 241st ACS National Meeting, Anaheim, CA (3/11) (*cancelled due to illness)*; "National Fresenius Award from Phi Lambda Upsilon/ACS: Symposium in Honor of Melanie Sanford," 241st ACS National Meeting, Anaheim, CA (3/11) (*cancelled due to illness)*; Lecturer, Organometallic Summer School "Marcial Moreno Mañas," sponsored by the Spain/England Consortium - Development of Organometallic Moieties for the Selective Functionalization of Organic Molecules, Santiago de Compostela, Spain (6/11); Keynote Lecturer, RSEQ Biennial Meeting, Royal Society of Chemistry of Spain, Valencia, Spain (7/11); "Building Bonds: A Joint China-U.S. Workshop for Women Researchers in Chemistry," Beijing, China (10/11).

Universities and Industry **2001**: ExxonMobil, Annandale, NJ (3/01); *Closs Lecturer*, University of Chicago, Chicago, IL (5/01); Los Alamos National Laboratories, Los Alamos, NM (11/01); University of New Mexico, Albuquerque, NM (11/01); University of Puget Sound, Tacoma, WA (11/01). **2002**: Dow Chemical, Midland, MI (8/02), University of Utah, Salt Lake City, UT (10/02). **2004**: *Departmental Colloquium,* Rutgers University, New Brunswick, NJ (11/04); General Electric Company, Niskayuna, NY (11/04). **2005**: University of Texas at Arlington (10/05). **2006**: University of Michigan, Ann Arbor, MI (4/06); University of California, San Diego, CA (11/06). **2007**: Cornell University, Ithaca, NY (8/07); University of Heidelberg (3 lecture series), Heidelberg, Germany, (10/07); BASF, Ludwigshafen, Germany (10/07); Harvard/MIT Inorganic Lecture, Cambridge, MA (11/07). **2008**: *Department Colloquium*, University of British Columbia, Vancouver, Canada (2/08); Bridgestone/Firestone, Akron, OH (4/08); *66th Frontiers in Chemistry Series,* Case Western Reserve, Cleveland, OH (4/08); University of California, Berkeley, CA (5/08). **2009**: Weyerhauser Company, Federal Way, WA (3/09); University of Wisconsin, Madison, WI (10/09); University of Calgary, Calgary, Canada (11/09); *Lemieux Lecturer,* University of Ottawa, Ottawa, Canada (11/09). **2010**: *Pioneers of Chemistry in Academia Lecture,* University of Illinois, Champaign-Urbana (4/10); Carleton College, Northfield, MN (5/10); University of Oregon, Eugene, OR (11/10); University of California, Irvine, CA (12/10). **2011**: University of Virginia, Charlottesville, VA (4/11).

Various invited talks at both conferences and universities were declined or postponed due to family obligations.

V. Publications: career total [86] in press [1] submitted [1] book chapters, reviews [3]

25 selected papers (of 66) since 2001:

1. Williams, B. S.; Goldberg, K. I. "Studies of Reductive Elimination Reactions to Form Carbon-Oxygen Bonds from Pt(IV) Complexes." *J. Am. Chem. Soc.* **2001**, 123, 2576-2587.
2. Fekl, U.; Kaminsky, W.; Goldberg, K. I. "A Stable Five-Coordinate Platinum(IV) Alkyl Complex." *J. Am. Chem. Soc*. **2001**, *123*, 6423-6424.
3. Fekl, U.; Goldberg, K. I. "Five-Coordinate Platinum(IV) as a Precursor to a Novel Pt(II) Olefin Hydride Complex for Alkane Activation." *J. Am. Chem. Soc*. **2002**, 124, 6804-6805.
4. Jensen, M. P.; Wick, D. D.; Reinartz, S.; White, P. S.; Templeton, J. L.; Goldberg, K. I. "Reductive Elimination/Oxidative Addition of Carbon-Hydrogen Bonds at Pt(IV)/Pt(II) Centers: Mechanistic Studies of the Solution Thermolyses of $Tp^{Me_2}Pt(CH_3)_2H$." *J. Am. Chem. Soc.* **2003**, *125*, 8614-8624.
5. Crumpton-Bregel, D. M.; Goldberg, K. I. "Mechanisms of C-C and C-H Alkane Reductive Eliminations from Octahedral Pt(IV): Reaction via Five-Coordinate Intermediates or Direct Elimination?" *J. Am. Chem. Soc*. **2003**, *125*, 9442-9456.
6. Fekl, U.; Kaminsky, W.; Goldberg, K. I. "β-Diiminate Platinum Complexes for Alkane Dehydrogenation." *J. Am. Chem. Soc*. **2003**, *125*, 15286-15287.
7. Look, J. L.; Fekl, U.; Goldberg, K. I. "Mechanisms of Reactions Related to Selective Alkane Oxidation by Pt Complexes." In *Activation and Functionalization of C-H Bonds;* Goldberg, K. I.; Goldman, A. S. Eds.; ACS Symposium Series 885; American Chemical Society: Washington, DC, **2004**, 283-302.
8. Denney, M. C.; Smythe, N. A.; Cetto, K. L.; Kemp, R. A.; Goldberg, K. I. "Insertion of Molecular Oxygen into a Palladium(II)-Hydride Bond" *J. Am. Chem. Soc*. **2006**, *128*, 2508-2509.

9. Kloek, S. M.; Heinekey, D. M.; Goldberg, K. I. "Stereoselective Decarbonylation of Methanol to Form a Stable Iridium(III) *Trans*-Dihydride Complex." *Organometallics* **2006,** *25*, 3007-3011.
10. Denney, M. C.; Pons, V.; Hebden, T. J.; Heinekey, D. M.; Goldberg, K. I. "Efficient Catalysis of Ammonia Borane Dehydrogenation." *J. Am. Chem. Soc*. **2006**, *128*, 12048-12049.
11. Kloek, S. M.; Goldberg, K. I. "Competitive C-H Bond Activation and β-Hydride Elimination at Platinum(II)." *J. Am. Chem. Soc.* **2007**, *129*, 3460-3461.
12. Kloek, S. M.; Heinekey, D. M.; Goldberg, K. I. "C-H Bond Activation by Rhodium(I)Hydroxide and Phenoxide Complexes." *Angew. Chem. Int. Ed*. **2007**, *46*, 4736-4738.
13. Pawlikowski, A. V.; Getty, A. D.; Goldberg, K. I. "Alkyl Carbon-Nitrogen Reductive Elimination from Pt(IV) Sulfonamide Complexes." *J. Am. Chem. Soc*. **2007**, *129*, 10382-10393.
14. Kloek, S. M.; Heinekey, D. M.; Goldberg, K. I. "C-H Bond Activation by Rhodium(I) Phenoxide and Acetate Complexes: Mechanism of H-D Exchange Between Arenes and Water." *Organometallics* **2008**, *27*, 1454-1463.
15. Hebden, T. J.; Denney, M. C.; Pons, V.; Piccoli, P. M. B.; Koetzle, T. F.; Schultz, A. J.; Kaminsky, W.; Goldberg, K. I.; Heinekey, D. M. "Sigma-borane complexes of iridium: Synthesis and structural characterization." *J. Am. Chem. Soc*. **2008**, *130*, 10812-10820.
16. Luedtke, A. T.; Goldberg, K. I. "Intermolecular hydroarylation of unactivated olefins catalyzed by homogeneous platinum complexes." *Angew. Chem. Int. Ed.* **2008**, *47*, 7694-7696. (Designated Very Important Paper (VIP) by the editor)
17. Smythe, N. A.; Grice, K. A.; Williams, B. S.; Goldberg, K. I. "Reductive Elimination and Dissociative β-Hydride Abstraction from Pt(IV) Hydroxide and Methoxide Complexes." *Organometallics* **2009**, *28*, 277–288.
18. Fulmer, G. R.; Muller, R. P.; Kemp, R. A.; Goldberg, K. I. "Hydrogenolysis of Palladium(II) Hydroxide and Methoxide Pincer Complexes." *J. Am. Chem. Soc*. **2009**, *131*, 1346-1347.
19. Look, J. L.; Wick, D. D.; Mayer, J. M.; Goldberg, K. I. "Autoxidation of Platinum(IV) Hydrocarbyl Hydride Complexes to Form Platinum(IV) Hydrocarbyl Hydroperoxide Complexes." *Inorg. Chem*. **2009**, *48*, 1356-1369.
20. Grice, K. A.; Goldberg, K. I. "Insertion of Dioxygen into a Platinum(II)-Methyl Bond to form a Pt(II) Methylperoxide Complex." *Organometallics* **2009**, *28*, 953-955.
21. Boro, B. J.; Duesler, E. N.; Goldberg, K.I.; Kemp, R. A. "Synthesis, Characterization, and Reactivity of Nickel Hydride Complexes Containing 2,6-$C_6H_3(CH_2PR_2)_2$ (R = *t*Bu, *c*Hex, and *i*Pr) Pincer Ligands" *Inorg. Chem*. **2009**, *48*, 5081-5087.
22. Bernskoetter, W. H.; Hanson, S. K.; Buzak, S. K.; Davis, Z.; White, P.S.; Swartz, R.; Goldberg, K.I.; Brookhart, M. "Investigations of Iridium Mediated Reversible C-H Bond Cleavage: Characterization of a 16-Electron Iridium(III) Methyl Hydride Complex." *J. Am. Chem. Soc.* **2009**, 131, 8603-8613.
23. Boisvert, L.; Denney, M. C.; Hanson, S. K.; Goldberg, K. I. "Insertion of Molecular Oxygen into a Palladium(II) Methyl Bond: A Radical Chain Mechanism Involving Palladium(III) Intermediates" *J. Am. Chem. Soc.* **2009**, *131*, 15802-15814.
24. Bernskoetter, W. H.; Schauer, C. K.; Goldberg, K.I.; Brookhart, M."Characterization of a Rhodium(I) -Methane Complex in Solution" *Science* **2009**, 326, 553-556.
25. Hebden, T. J.; St. John, A. J.; Gusev, D. G.; Kaminsky, W.; Goldberg, K. I.; Heinekey, D. M. "Preparation of a Dihydrogen Complex of Cobalt" *Angew. Chem. Int. Ed. Engl.* **2011**, *50(8),* 1873-1876. (Designated Very Important Paper (VIP) by the editor)

VI. Grant Activity (2001-present):

1/11-12/12	"Developing Catalysts for the Selective Depolymerization of Lignocellulose," Postdoctoral Program in Environmental Chemistry	Camille & Henry Dreyfus Found.	$120,000
8/10-7/13	"Novel Platinum and Palladium Reactions Relevant to Hydrocarbon Functionalization"	NSF	$484,000
1/09-12/11	"Direct Partial Oxidations Using Molecular Oxygen," as a co-PI with Richard Kemp, University of New Mexico (funds listed are UW portion)	DOE	$368,500
9/07-8/12	PI for "Center for Enabling New Technologies Through Catalysis", CBC Phase II, 18 investigators at 12 institutions and one national lab	NSF	$15,365,458 (center total)
8/07-7/10	"Organometallic Reactions Relevant to the Functionalization of Alkanes," (no-cost extension through 8/11)	NSF	$498,000
1/06-12/08	"Direct Epoxidation Using Molecular Oxygen", as a co-PI with Richard	DOE	$368,500

	Kemp, University of New Mexico (funds listed are UW portion)		
3/05-2/10	"LANL/PNNL Virtual Center for Chemical Hydrogen Storage: Hydrogenation/Dehydrogenation of BN bonds", co-PI: D.M. Heinekey	DOE	$955,000
1/05-12/06	"Two Year Extension for Special Creativity- Organometallic Reactions Relevant to the Functionalization of Alkanes"	NSF	$295,000
9/04-8/07	"Center for the Activation and Transformation of Strong Bonds", UW co-PIs: W Borden, E Davidson, M Heinekey, J Mayer and senior investigators at seven other institutions, NSF CBC Phase I	NSF	$1,500,000 (center total)
5/03-10/05	"Beyond Nanoparticles - Attack on a Chemical 'Holy Grail'" (Co-PI, PI: Richard Kemp, Sandia National Laboratory)	DOE	$100,000
1/02-1/05	"Organometallic Reactions Relevant to the Functionalization of Alkanes"	NSF	$382,000
1/03-9/04	Advance Professorship-Transitional Support Award	UW ADVANCE	$19,000
9/02-8/04	"Carbon-Heteroatom Reductive Elimination from High Oxidation State Late Metal Centers,"	ACS-Petroleum Research Fund	$40,000
7/03-9/03	Supplement to "Carbon-Heteroatom Reductive Elimination from High Oxidation State Late Metal Centers," summer support for a faculty member from an Undergraduate Institution	ACS-Petroleum Research Fund	$7,500
9/00-8/02	"Carbon-Heteroatom Reductive Elimination Reactions from Pt(IV) and other High Oxidation State Late Metal Centers,"	ACS-Petroleum Research Fund	$60,000
3/98-2/02	"Energetics and Mechanisms of Organometallic Reactions Relevant to the Functionalization of Alkanes"	NSF	$288,000
6/97-6/01	Alfred P. Sloan Research Fellowship	Sloan Found.	$35,000

VII. Honors and Awards (2001-present):

Closs Lecturer, University of Chicago 2001, NSF Creativity Extension (2005-06), AWIS NY Metro Outstanding Woman Scientist (2006), UW Lawton Distinguished Scholar in Chemistry (2007-10), Lemieux Lecturer, Univ. of Ottawa (2009), Pioneers of Chemistry in Academia Lecturer, Univ. of Illinois (2010), Nicole A. Boand Endowed Professor in Chemistry 2010-present), Joseph Meyerhoff Visiting Professor at the Weizmann Institute (2012)

VIII. Additional Comments on Research, Teaching, and Service:

Professional Society Services

Symposium Co-Organizer: "Organometallic Chemistry" at the 56th ACS Northwest Regional Meeting, Seattle, WA (6/01), Activation and Functionalization of C-H Bonds" at the 223rd ACS National Meeting, Orlando, FL (4/02), Undergraduate Research Symposium sponsored by the ACS Puget Sound Section, Seattle, WA (5/02), "Synthesis and Mechanism in Late Transition Metal Organometallics" Pacifichem 2005, Hawaii (12/05)

Session Chairperson: 222nd ACS National Meeting, Chicago, IL (8/01), 223rd ACS National Meeting, Orlando, FL (4/02), 56th ACS Northwest Regional Meeting (6/01)

Invited Participant in National Science Foundation Workshop "Frontiers of Inorganic Chemistry" (Workshop focused on the funding priorities in the field for the next 10-20 years. Copper Mountain, CO (9/01); Invited Keynote Speaker and Participant at Department of Energy, Basic Energy Sciences Workshop on "Directions in Homogeneous Catalysis" Chicago, IL (9/02); Invited Participant in Department of Energy, Basic Energy Sciences Workshop on "Basic Research Needs for Catalysis" Washington, DC (8/07)

Co-Vice Chair of the Gordon Conference on Green Chemistry, Davidson, NC, (7/10); Co-Chair of the Gordon Conference on Green Chemistry Italy (7/12)

Alternate Councilor of the Inorganic Division of the American Chemical Society (1999-2001)

Editorial Advisory Board Member: *Inorganic Chemistry* (2002-2004*), Accounts of Chemical Research* (2004-2012*), Organometallics* (2008-2013*)*

Sloan Research Fellowships Chemistry Program Committee Member (2010-2012)

Summary of Selected Professional Activities

Name: **Heinekey** Date of Revised Vitae: **6/2011**
Rank: Professor Date of Ph.D.: 1982 Date of UW hire: 1991 Date of last promotion: 1995

I. Courses Taught:

Chem 110(3), 152(3), 162(2), 164(2), 165(9), 417(5), 496, 591(many), 317(5), 590B, 508(4), 510

II. Department and University Service:

Departmental Committees:

Graduate Education, Chair's Advisory, Awards, Safety. Served as chemistry department vice chair for graduate education until 2008. Previously served as vice chair for the undergraduate program.

College and UW Committees:

A&S Dean's mission statement committee; A&S Dean's committee on writing requirements; Chair, Physics dept. chair search committee; Provost's committee on the undergraduate experience; Graduate School committee on tuition policy. Ad hoc steering committee for the Integrated Sciences major.

166 Total Other Graduate Supervisory Committees: (does not include students in own group)

III. Research Group (current):

5	graduate students	1	Postdoctoral associates	21	Ph.D.s granted (career total)
3	undergraduate students	1	Murdoch Fellowship HS teacher	1	Exchange student

IV. Invited Lectures: career total 158

Since 2001

2001: Symposium on Quantum Atomic and Molecular Tunneling in Solids, Notthingham, UK; University of Durham, Australian National University, University of Sydney, University of New South Wales.

2002: Columbia University, Yale University, Brookhaven National Laboratory, Claremont Colleges JSP seminar, University of Alberta, ACS Symposium on Hydrogenase Models, Boston. ACS Symposium on Molecules with Unusual Bonding Modes, Spokane

2003: University of Konstanz, University of Zurich, ACS Symposium on Aspects of Chemical Bonding, NY national meeting, University of Puget Sound, University of Oregon.

2004: UC San Diego, Gordon Conference on Isotope Effects, Ventura; ACS Regional Meeting, Logan; American Crystallographic Association National Meeting, Chicago, California State University, San Diego, California State University, Sacramento.

2005: Hope College, Calvin College, University of British Columbia, ACS Pacifichem meeting, Hydride Symposium.

2006: Inorganic Chemistry Gordon Conference, Newport; International Symposium on Materials Issues in Hydrogen Production and Storage, Santa Barbara; Texas A & M University; Trinity College; University of North Texas Denton; University of San Diego.

2007: University of Illinois; UT Austin; Organometallic Chemistry Gordon Conference, Newport; Argonne National Lab User's Conference; 8th International Conference on Hydrogenase Enzymes, Breckenridge; ACS Symposium on Hydrogen Storage, Boston; Universitat Autònoma de Barcelona; Institute of Chemical Research of Catalonia, Tarragona; University of Montpellier; CNRS Toulouse; Second LANL-NEDO-AIST Workshop on Fuel Cell Performance Improvement & Hydrogen Storage Materials, Tokyo.

2008: Boise State University; California State University Fullerton; CSC National Meeting, Edmonton; 4th International Symposium on Bioorganometallic Chemistry; NSF sponsored Inorganic chemistry workshop, University of Windsor, University of Miami; University of New Mexico; Los Alamos National Laboratory; Spelman College; Willamette University

2009: International Conference on Hydrogen and Hydrogen Storage, Bangalore; Tuskegee University; University of North Carolina; University of North Dakota; University of Victoria; ACS Symposium on H_2 Storage, DC natl. meeting; Texas Lutheran University.

2010: Yale University; Western Washington University; University of Cape Town; University of the Witwatersrand; Pacific Northwest National Lab; CIC Conference, Toronto; Inorganic Chemistry Gordon Conference (vice-chair), UC Berkeley.

2011: University of the Pacific, Iowa State University, University of Toronto, McMaster University, Guelph University, Brock University, University of Ottawa, Queen's University, Rutgers University, Emory University, Anaheim ACS meeting (x2), Denver ACS meeting.

V. Publications: career total 95 in press 3 submitted 3 book chapters, reviews 2

Since 2001:

"H-H Distances in Elongated Transition Metal Dihydrogen Complexes: Effects of Temperature and Isotopic Substitution." James K. Law, Heather Mellows, and D. M. Heinekey. *J. Am. Chem. Soc*. **2001**, *123*, 2085-2086. DOI: 10.1021/ja005536z

"Kubas Complexes Revisited: Novel Dihydride Complexes of Tungsten." D. M. Heinekey, James K. Law, and Steven M. Schultz. *J. Am. Chem. Soc*. **2001**, *123*, 12728-12729. DOI: 10.1021/ja016766w

"Synthesis and Spectroscopic Properties of Elongated Ruthenium Dihydrogen Complexes: Temperature and Isotope Dependence of H-H Distances. James K. Law, Heather Mellows, and D. M. Heinekey. *J. Am. Chem. Soc*. **2002**, *124*, 1024-1030. DOI: 10.1021/ja0118284

"Synthesis and Investigation of $[Cp^*(PMe_3)Rh(H)(H_2)]^+$ and its Partially Deuterated and Tritiated Isotopomers: Evidence for a Hydride/Dihydrogen Structure." Felicia L. Taw, Heather Mellows, Peter S. White, Frederick J. Hollander, Robert G. Bergman, Maurice Brookhart and D. M. Heinekey. *J. Am. Chem. Soc*. **2002**, *124*, 5100-5108. DOI: 10.1021/ja0165990

"Multisite Magnetization Transfer Studies of Metal Migration in $(\eta 3\text{-}C_7H_7)Re(CO)_4$, $(\eta 3\text{-}C_7H_7)Os(CO)_3SnPh_3$, $(\eta 3\text{-}C_7H_7)Re(CO)_3PMe_3$, $(\eta 5\text{-}C_7H_7)Re(CO)_3$, $(\eta 5\text{-}C_7H_7)Fe(CO)_2SnPh_3$, $(\eta 5\text{-}C_7H_7)Os(CO)_2SnPh_3$, and $(\eta 5\text{-}C_7H_7)Ru(CO)_2SnPh_3$." Muhandiram, D. R.; Kiel, G.-Y.; Aarts, G. H. M.; Saez, I. M.; Reuvers, J. G. A.; Heinekey, D. M.; Graham, W. A. G.; Takats, J.; McClung, R. E. D. *Organometallics*, **2002**, *21*, 2687-2704. DOI: 10.1021/om011061o

"Novel Intramolecular C-H bond Activation in an Iridium dppm Complex." Jackson S. Wiley, J. and D. M. Heinekey. *Inorg. Chem.* **2002**, *41*, 4961-4966. DOI: 10.1021/ic0257367

"An Elongated Dihydrogen Complex of Iridium." Vincent Pons and D. M. Heinekey. *J. Am. Chem. Soc*. **2003**, *125*, 8428-8429. DOI: 10.1021/ja035555j

"Dinuclear Iron Isonitrile Complexes: Models for the Fe Hydrogenase Active Site." Jennifer L. Nehring and D. M. Heinekey. *Inorg. Chem*. **2003**, *42*, 4288-4292. DOI: 10.1021/ic034334b

"Elongated H_2 Complexes:What remains of the H-H Bond?" D. M Heinekey, A Lledós, J.M. Lluch . *Chem. Soc. Rev.* **2004**, *33*, 175-182. DOI: 10.1039/b304879a

"Structure and Dynamics of a Dihydrogen/Hydride Ansa Molybdenocene Complex." Vincent Pons, Stephen L. J. Conway, Malcolm L. H. Green, Jennifer C. Green, Benjamin J. Herbert and D. M. Heinekey. *Inorg. Chem.* **2004**, *43*, 3475-3483. DOI: 10.1021/ic0496875

"Synthesis and Properties of Compressed Dihydride Complexes of Iridium: Theoretical and Spectroscopic Investigations." Ricard Gelabert, Miqel Moreno, José M. Lluch, Agustí Lledós, Vincent Pons and D. M. Heinekey. *J. Am. Chem. Soc.* **2004**, *126*, 8813-8822. DOI: 10.1021/ja048775l

"Dihydrogen Complexes of Electrophilic Metal Centers: Observation of $Cr(CO)_5(H_2)$, $W(CO)_5(H_2)$ and $[Re(CO)_5(H_2)]^+$." Steven L. Matthews, Vincent Pons and D. M. Heinekey. *J. Am. Chem. Soc*.**2005**, *127*, 850-851. DOI: 10.1021/ja0433370

"14-Electron Iridium (III) Dihydride Complex Capable of Intramolecular C-H Activation." Natalie M. Scott, Vincent Pons, Edwin M. Stevens, D. M. Heinekey and Steven P. Nolan. *Angewandte Chemie*, **2005**, *44*, 2512-2515. DOI: 10.1002/anie.200463000

"Determination of the Temperature Dependence of the H-D Spin-Spin Coupling Constant and the Isotope Effect on the Proton Chemical Shift for a Compressed Dihydride Complex of Iridium." Ricard Gelabert, Miquel Moreno, José M. Lluch, Agustí Lledós and D. M. Heinekey. *J. Am. Chem. Soc*. **2005**, 127, 5632-5640. DOI: 10.1021/ja043011r

"Synthesis and Characterization of a Dicationic Dihydrogen Complex of Iridium with a Bis-Carbene Ligand Set." Matthias Vogt, Vincent Pons, and D. M. Heinekey. *Organometallics*, **2005**, *24*, 1832-1836. DOI: 10.1021/om049045p

"Photochemical Generation of Dihydrogen Complexes of Chromium and Tungsten." Steve Matthews and D. M. Heinekey *J. Am. Chem. Soc*. **2006**, *128*, 2615-2620. DOI: 10.1021/ja057912r

"Stereoselective Decarbonylation of Methanol to From a Stable Iridium(III)*trans*-Dihydride Complex." Susan M. Kloek, D. M. Heinekey and K. I. Goldberg. *Organometallics*, **2006**, *25*, 3007-3011. DOI: 10.1021/om051098z

"Silane Complexes of Electrophilic Metal Centers." D. M. Heinekey, Steven Matthews and V. Pons. *Inorg. Chem.***2006**, *45*, 6453-6459. DOI: 10.1021/ic052134p

"Structure and Dynamics of a Compressed Dihydride Complex of Osmium." Nils Schloerer, Vincent Pons, Dmitry G. Gusev and D. M. Heinekey, *Organometallics*, **2006**, *25*, 3481-3485. DOI: 10.1021/om060284h

"Efficient Catalysis of Ammonia Borane Dehydrogenation." Melanie Denny, Vincent Pons, Travis J. Hebden, K. I. Goldberg and D. M. Heinekey, *J. Am. Chem. Soc*. **2006**, *128*, 12048-12049. DOI: 10.1021/ja062419g

"Active site Models for Fe Hydrogenases: Reduction Chemistry of Dinuclear Iron Complexes." Inigo Aguirre De Carcer, Antonio DiPasquale, A. L. Rheingold and D. M. Heinekey. *Inorg. Chem.***2006**, *45*, 8000-8002. DOI: 10.1021/ic0610381

"Temperature and Solvent Dependent Binding of Dihydrogen in Iridium Pincer Complexes." Inigo Göttker-Schnetmann, D. M. Heinekey and Maurice Brookhart. *J. Am. Chem. Soc*. **2006**, *128*, 17114-17119. DOI: 10.1021/ja065854j

"Cationic Dihydrogen/Dihydride Complexes of Osmium: Structure and Dynamics." Jonathan Egbert, R. Morris Bullock and D. M.Heinekey. *Organometallics*, **2007**, *26*, 2291-2295. DOI: 10.1021/om0700718

"C-H Bond Activation by Rhodium(I) Hydroxide and Phenoxide Complexes." Susan M. Kloek, D. M. Heinekey and Karen I. Goldberg *Angewandte Chemie*, **2007,** *46*, 4736-4738. DOI: 10.1002/anie.200700270

"Transition Metal Dihydrogen Complexes: Isotope Effects on Reactivity and Structure." D. M. Heinekey, invited review for *J. Labelled Compounds and Radiopharmaceuticals*, **2007**, *50*, 1063-1071. DOI: 10.1002/jlcr.1385

"C-H Bond Activation by Rhodium(I) Phenoxide and Acetate Complexes: Mechanism of H-D Exchange Between Arenes and water." Susan M. Kloek, D. M. Heinekey and K. I. Goldberg. *Organometallics*, **2008**, *27*, 1454-1463. DOI: 10.1021/om7012259

"Sigma Borane Complexes of Iridium: Synthesis and Structural Characterization." Melanie Denny, Travis J. Hebden, Vincent Pons, K. I. Goldberg, Paula Picolli, Arthur J. Schultz, Tom Koetzle and D. M. Heinekey, *J. Am. Chem. Soc.*, **2008**, *130*, 10812-10820. DOI: 10.1021/ja801898m

"A convenient one pot synthesis of di t-butylphosphinic chloride." Daniel F. Brayton, Karen I. Goldberg, Werner Kaminsky and D. M. Heinekey. *Phosphorus, Sulfur, and Silicon and the Related Elements*, **2008**, *183*, 2534-2540. . DOI: 10.1080/10426500801967781

"Iridium Catalyzed Dehydrogenation of Substituted Amine-Boranes: Kinetics, Thermodynamics and Implications for Hydrogen Storage." Brandon L. Dietrich, Karen I. Goldberg, D. M. Heinekey, Tom Autrey, John Linehan *Inorg Chem*, **2008**, *47*, 8583-8585. DOI: 10.1021/ic801161g

"Synthesis and Structure of Molybdenum and Tungsten Bisphosphine Carbonyl Dimers." Daniel F. Brayton and D. M. Heinekey, *Organometallics*, **2008**, 27, 3901-3906 DOI: 10.1021/om800273t

"Synthesis and Characterization of Sulfur Rich Iron(II) Carbonyl Dimers: Facile Reversible Reaction with Carbon Monoxide." Inigo Aguirre De Carcer and D. M. Heinekey *J. Organomet. Chemistry*, **2009**, *694*, 840-844 DOI: 10.1016/j.jorganchem.2008.06.038

"Activation of H_2 by Palladium (0): Formation of the Monomeric Dihydride Complex *trans* [(IPr)(PCy_3)Pd($H)_2$]." Serena Fantasia, Jonathan D. Egbert, Heiko Jacobsen, Luigi Cavallo, D. M. Heinekey and Steven P. Nolan. *Angewandte Chemie*, **2009**, *48*, 5182-5186. DOI: 10.1002/ange.200900463

"Hydrogenase Enzymes: Recent Structural Studies and Active Site Models." D. M. Heinekey *J. Organomet. Chem*, **2009** *694***,** 2671-2680. DOI: 10.1016/j.jorganchem.2009.03.047

"Dinuclear Iridium Complexes Containing Cp^* and Carbonyl Ligands: Synthesis, Structure and Reactivity." Joseph Meredith, Karen I. Goldberg, Werner Kaminsky and D. M. Heinekey, *Organometallics*, **2009**, *28*, 3456-3451. DOI: 10.1021/om900186j

"Dihydrogen/Dihydride or Tetrahydride? An Experimental and Computational Investigation of Pincer Iridium Polyhydrides." Travis J. Hebden, Karen I. Goldberg, Alan S. Goldman, K. Krogh-Jespersen, Thomas J. Emge and D. M. Heinekey, *Inorganic Chemistry*, **2010**, *49*, 1733-1742. DOI**:**10.1021/ic902163w.

"Activation of Molecular Hydrogen." G. J. Kubas and D. M. Heinekey in *Physical Inorganic Chemistry: Reactions, Processes and Applications*. Bakac. A., Ed., Wiley, NY 2010. John Wiley & Sons, **2010**. DOI: 10.1002/9780470602577.ch5

"Dihydrogen Complexes of the Chromium Group: Synthesis and Characterization." Jonathan D. Egbert, D. M. Heinekey, *Organometallics*, **2010**, *29*, 3387-3391. DOI: 10.1021/om100416w

"A Carbonyl-rich Bridging Hydride Complex Relevant to the Fe-Fe Hydrogenase Active Site." Steve Matthews and D. M. Heinekey. *Inorganic Chemistry*, **2010**, *49*, 9746-9748. DOI:10.1021/ic1017328.

"Preparation of a Dihydrogen Complex of Cobalt." Travis J. Hebden, Anthony J. St. John, Dmitry G. Gusev, Werner Kaminsky, Karen I. Goldberg, D. Michael Heinekey. *Angewandte Chemie*, **2011**, *50*, 1873-1876. DOI: 10.1002/anie.201005281. This paper was featured as a V.I.P and was the subject of a commentary: DOI: 10.1002/ange.2010067313

"Metal-free Carbon Dioxide Reduction and Acidic C-H Activations using a Frustrated Lewis Pair." Sophia D. Tran, Tristan A. Tronic, Werner Kaminsky, D. M. Heinekey and J. M. Mayer. *Inorganica Chimica Acta*, **2011**, *369*, 126-132. doi:10.1016/j.ica.2010.12.022

"Synthesis, Characterization and Reactivity of Arene-Stabilized Rhodium Complexes." Abby R. O'Connor, Werner Kaminsky, D. Michael Heinekey, and Karen I. Goldberg. *Organometallics*, **2011**, *30*, 2105-2116. DOI: 10.1021/om1009473

"Synthesis, Characterization and Reactivity of Iridium NHC Pincer Complexes." Katherine M. Schultz, Karen I. Goldberg, Dmitry G. Gusev and D. Michael Heinekey. *Organometallics*, **2011**, *30*, 1429–1437. DOI: 10.1021/om101024x

---

VI. Grant Activity:

Source	Project Title	Amount (D+ I Costs)	Period
Royalty Research Fund	Hydrogenase Active Site Models	$22,000	9/01-9/02
National Science Foundation	Synthesis and Reactivity of Transition Metal Hydrides	$375,000	1/02-12/04
National Science Foundation	Sigma Bond Complexes	$475,000	1/05-12/07
Petroleum Research Fund	Active Site Models for Fe Hydrogenases	$120,000	9/02-9/05
National Science Foundation	Hydrogen: Catalysts for Production and Utilization	$462,000	03/08-03/11
Department of Energy	Chemical Hydrogen Storage (with Goldberg)	$1,100,000	03/05-03/11
National Science Foundation	CENTC	$111,000	08/11-08/12
Royalty Research Fund	Catalytic Hydrogenolysis of Freons	$36,057	06/11-06/12
National Science Foundation	Hydrogen: Catalysts for Production and Utilization	$834,073	pending

---

VII. Honors and Awards:

NSERC postdoctoral fellowship, UC Berkeley, 1983-1984.

VIII. Additional Comments on Research, Teaching, and Service:

Summary of Selected Professional Activities

Name: Paul B. Hopkins Date of Revised Vitae: September 2011
Rank: Professor and Chair Date of Ph.D.: 1982 Date of UW hire: 1982 Date of last promotion: 1993

I. Courses Taught (only list course number & times taught, e.g. "CHEM 142 (12)"):

CHEM 235, 238, 239, 336, 337, 241, 242, 246, 247, 436, 460, 530, 532, 540

II. Department and University Service:

Department Committees: Graduate Student Recruiting (1983-87, 1990-91); Graduate Student Admissions (1983-84); Organic Faculty Search (1984-89); UW Pacific Coast Lecture Series Coordinator (1984-88); Organic Seminar Coordinator (1985-88); Chair, Spectral Services Committee (9/1985-1987); Chair, Fundraising (1985-90); Executive Committee (1988-90); Budget Committee (1988-89); Chemistry Building Programming (1989); Graduate Program (1989-90); Chair, Long-Range Planning (1990-92); Fundraising (1990-93); Chemistry New Building Committee (1990); Inorganic Faculty Search (1990-91); Biotechnology Training Grant Oversight (1992-93); Academic Personnel (1993-95); Curriculum Committee (1993)

College and University Committees: Phi Beta Kappa Selection (1985-89); Joint Chemistry/Physics Building Site Selection (1989); Biology Program Review (1993); Physics Chair Search (1993-94); Policy Board, Center for Process Analytical Chemistry (1995-2009); Performance Review of Vice Provost and Dean Fred Campbell (1997-98); Arts & Sciences Budget Advisory, (2002-03, 2008, 2009); Selection Jury Member, Research Technology Building (2003-04), Chair, Review of Office of Research Information Services (2005-06); Research Advisory Board for Vice Provost for Research (2005-11); University Chemical Hazards Advisory Group (2005-07); Faculty Senate Planning and Budgeting (2007-13); Faculty Senate Executive Committee (2007-08); Provost's Activity Based Budgeting Working Group (2009); Arts & Sciences Activity Based Budgeting Working Group (2009); Provost's Activity Based Budgeting Steering Committee (2009-present); Goldwater Selection Committee (2009); Robinson Center for Young Scholars Advisory Board (2011-12)

0	Total Other Graduate Supervisory Committees: (does not include students in own group)

III. Research Group (current):

0	graduate students	0	Postdoctoral associates	16	Ph.D.s granted (career total)
0	undergraduate students	0	other Visiting Faculty		

IV. Invited Lectures: career total ~100

1984: Purdue University Procter & Gamble (Cincinnati, OH); Eli Lilly (Indianapolis, IN)

1985: University of Oregon; Western Washington University; Abbott (Chicago, IL); NSF Workshop on Synthesis and Natural Products Chemistry

1986: Oregon State University; University of California, Davis; University of California, Irvine; Ohio State University; Procter & Gamble (Cincinnati, OH); Upjohn (Kalamazoo, MI)

1987: University of Washington; University of California, Berkeley; Stanford University; California Institute of Technology; Abbott (Chicago, IL); NeoRx (Seattle, WA); Searle Scholars Meeting

1988: Johns Hopkins University; New York University; Microprobe (Seattle, WA); ICI (Wilmington, DE); DuPont (Wilmington, DE); NSF Workshop on Synthesis and Natural Products Chemistry

1989: Utah State University; University of Utah; University of Colorado; Kansas State University; University of Kansas; Lewis and Clark College; Reed College; University of Texas, Austin (Medicinal Chemistry); Texas A & M University (Biochemistry), DE); NSF Workshop on Synthesis and Natural Products Chemistry; NSF Workshop on Molecular Recognition

1990: Occidental College; Harvey Mudd College; University of Puget Sound; University of Chicago; Pacific Lutheran University; University of Illinois; Rose-Hulman Institute of Technology; Seattle University; University of Washington (Biochemistry); University of Pittsburgh; Massachusetts Institute of Technology; Princeton University; University of Washington; University of California, Irvine; Oregon State University Merck Frosst (Montreal, Canada); Eli Lilly(Indianapolis, IN); Upjohn (Kalamazoo, MI); NSF Workshop on Synthesis and Natural Products Chemistry; 200th ACS National Meeting (2 lectures)

1991: University of British Columbia; Hunter College; Boston College; Hoffmann-La Roche (Nutley, NJ); Heterocycles Gordon Conference; 7th Conversation in Biomolecular Stereodynamics

1992: University of Southern California; Battelle Pacific Northwest Labs; University of Virginia; University of North Carolina; University of Michigan; Schering-Plough; American Cyanamid Co. (Pearl River, NY); Parke-Davis (Ann Arbor, MI); 203rd ACS National Meeting (Peptide Symposium); 204th ACS National Meeting (Cope Scholar Award); American Association of Cancer Research

1993: University of Victoria; University of Colorado; Washington State University; University of Washington; University of Alberta; Vanderbilt; Nexagen; ISIS Pharmaceutical; ACS SW Region (DNA Drug Symposium)
1994: University of Nebraska; Purdue University (Chemistry); Purdue University (Medicinal Chemistry); Johns Hopkins University (Biochemistry)
1995: Colorado State University; University of South Carolina; Duke University
1996: 211th ACS National Meeting (Chemotherapy Symposium); Bioorganic Gordon Conference; 20th IUPAC Symposium on Natural Products Chemistry; ACS Regional Meeting, SE Section (Drug-DNA Symposium); SUNY Buffalo Medicinal Chemistry Symposium
1997: 212th ACS National Meeting (Nucleic Acid Symposium)
1998: Pacific Lutheran University

V. Publications: career total [90] in press [0] submitted [0] book chapters, reviews [2]

1. "Chlorosulfenylation-Dehydrochlorination Reactions. New and Improved Methodology for the Synthesis of Unsaturated Aryl Sulfides and Aryl Sulfones," Paul B. Hopkins and Philip L. Fuchs, *J. Org. Chem.* 1978, 43, 1208.
2. "Total Synthesis of Erythromycins. 5. Total Synthesis of Erythronolide A," E.J. Corey, Paul B. Hopkins, Sunggak Kim, Sung-eun Yoo, Krishnan P. Nambiar, and J.R. Falck, *J. Am. Chem. Soc.* 1979, 101, 7131.
5. "A Stereocontrolled and Effective Synthesis of Leukotriene B," E.J. Corey, Anthony Marfat, John E. Munroe, Kwan S. Kim, Paul B. Hopkins, and Francis Brion, *Tetrahedron Lett.* 1981, 22, 1077.
6. "A Mild Procedure for the Conversion of 1,2-Diols to Olefins," E.J. Corey and Paul B. Hopkins, *Tetrahedron Lett.* 1982, 22, 1979.
8. "Diisopropylsilyl Ditriflate and Di-tert-butylsilyl Ditriflate: New Reagents for the Protection of Diols," E.J. Corey and Paul B. Hopkins, *Tetrahedron Lett.* 1983, 23, 4871.
9. "Synthesis of Protected Allylic Amines from Allylic Phenyl Selenides: Improved Conditions for the Chloramine T Oxidation of Allylic Phenyl Selenides," J. E. Fankhauser, R. M. Peevey, and P. B. Hopkins, *Tet. Lett.* 1984, 25, 15.
13. "Asymmetric Carbon-Nitrogen Bond Formation using Optically Active Allylic Selenides. A New General Synthesis of Optically Active α-Amino Acids," Regan G. Shea, Jeffrey N. Fitzner, John E. Fankhauser, and Paul B. Hopkins, *J. Org. Chem.* 1985, 50, 417.
15. "A New Synthesis of Secondary Allylic Aliphatic and Aromatic Amines," Andreas Spaltenstein, Philip A. Carpino, and Paul B. Hopkins, *Tetrahedron Lett.* 1986, 27, 147.
18. "Ovothiol: A Novel Thiohistidine Compound from Sea Urchin Eggs that Confers NAD(P)H-O_2 Oxidoreductase Activity on Ovoperoxidase," Eric Turner, Rachel Klevit, Paul B. Hopkins, and Bennett M. Shapiro, *J. Biol. Chem.* 1986, 261, 13056.
22. "Fluoro Ketone-Containing Peptides as Inhibitors of Human Renin," Karen Fearon, Andreas Spaltenstein, Paul B. Hopkins and Michael H. Gelb, *J. Med. Chem.* 1987, 30, 1617.
24. "Isolation and Characterization of a Stable Simple Enol," Daniel V. Pratt and Paul B. Hopkins, *J. Am. Chem. Soc.* 1987, 109, 5553 (Communication). See: Chemtracts Organic Chemistry 1988, 168.
25. "Synthesis and Structure Reassignment of Mercaptohistidines of Marine Origin. Syntheses of L-Ovothiols A and C," T. P. Holler, A. Spaltenstein, E. Turner, R. E. Klevit, B. M. Shapiro, and P. B. Hopkins, *J. Org. Chem.* 1987, 52, 4420.
28. "A Rigid and Non-Perturbing Probe for DNA Motion," Andreas Spaltenstein, Bruce H. Robinson, and Paul B. Hopkins, *J. Am. Chem. Soc.* 1988, 110, 1299 (Communication).
29. "Ovothiols as Biological Antioxidants. The Thiol Groups of Ovothiol and Glutathione are Chemically Distinct," Tod P. Holler and Paul B. Hopkins, *J. Am. Chem. Soc.* 1988, 110, 4837 (Communication).
30. "Anionic Oxy-Claisen Rearrangement of a Tricyclic α-Allyloxy Ketone," James J. Kirchner, Daniel V. Pratt and Paul B. Hopkins *Tetrahedron Lett.* 1988, 29, 4229.
32. "DNA Structural Data from a Dynamics Probe: The Dynamic Signatures of Single Stranded, Hairpin-Looped, and Duplex Forms of DNA are Distinguishable," Andreas Spaltenstein, Bruce H. Robinson, and Paul B. Hopkins, *J. Am. Chem. Soc.* 1989, 111, 2303 (Communication).
34. "Total Synthesis of Marine Mercaptohistidines: Ovothiols A, B, and C," Tod P. Holler, Fuqiang Ruan, Andreas Spaltenstein, and Paul B. Hopkins, *J. Org. Chem.* 1989, 54, 4570.
36. "Determination at Single Nucleotide Resolution of the Sequence Specificity of DNA Interstrand Crosslinking Agents in DNA Fragments," M.F. Weidner, J.T. Millard, and P.B. Hopkins, *J. Am. Chem. Soc.* 1989, 111, 9270.
37. "Ovothiols as Free Radical Scavengers and the Mechanism of the Ovothiol-Promoted NAD(P)H-O_2 Oxidoreductase Activity of Ovoperoxidase," Tod P. Holler and Paul B. Hopkins, *Biochemistry* 1990, 29, 1953.
39. "Mechlorethamine Crosslinks Deoxyguanosine Residues at 5'-GNC Sequences in Duplex DNA Fragments," Julie T. Millard, Stanley Raucher, and Paul B. Hopkins, *J. Am. Chem. Soc.* 1990, 112, 2459 (Communication).

40. "Determination of the DNA Crosslinking Sequence Specificity of Reductively Activated Mitomycin C at Single Nucleotide Resolution: Deoxyguanosine Residues at CpG are Crosslinked Preferentially," Julie T. Millard, Margaret F. Weidner, Stanley Raucher, and Paul B. Hopkins, *J. Am. Chem. Soc.* 1990, 112, 3637.
42. "Sequence Preferences of DNA Interstrand Crosslinking Agents: dG-to-dG Crosslinking at 5'-CG by Structurally Simplified Analogs of Mitomycin C," Margaret F. Weidner, Snorri Th. Sigurdsson, and Paul B. Hopkins, *Biochemistry,* 1990, 29, 9225-9233.
43. "Metal Ion-Enhanced Helicity in Synthetic Peptides Containing Unnatural, Metal Ligating Residues," Fuqiang Ruan, Yanqiu Chen, and Paul B. Hopkins, *J. Am. Chem. Soc.* 1990, 112, 9403 (Communication). *See* The Scientist, Articles Alert, February 18, 1991, p. 18; Chemtracts 1991, 4, 135.
44. "Sequence Preferences of DNA Interstrand Cross-Linking Agents: Importance of Minimal DNA Structural Reorganization in the Cross-Linking Reactions of Mechlorethamine, Cisplatin, and Mitomycin C," Paul B. Hopkins, Julie T. Millard, Jinsuk Woo, Margaret F. Weidner, James J. Kirchner, Snorri Th. Sigurdsson, and Stanley Raucher, *Tetrahedron* 1991, 47, 2475 (Invited contribution).
46. "Synthesis of Peptides Containing Unnatural, Metal-Ligating Residues: Aminodiacetic Acid as a Peptide Side Chain," Fuqiang Ruan, Y. Chen, Katsumi Itoh, Tomikazu Sasaki, and Paul B. Hopkins, *J. Org. Chem.* 1991, 56, 4347.
47. "Nitrous Acid Cross-Links Duplex DNA Fragments through Deoxyguanosine Residues at the Sequence 5'-CG," James J. Kirchner and Paul B. Hopkins, *J. Am. Chem. Soc.* 1991, 113, 4681 (Communication).
50. "Interstrand Cross-Linking of Duplex DNA by Nitrous Acid: Determination of the Sequence Preference at Nucleotide Resolution," James J. Kirchner, Marjorie S. Solomon, and Paul B. Hopkins, in Structure and Function, Vol. 1: Nucleic Acids, R.H. Sarma and M.H. Sarma, Eds., Adenine Press: Albany, NY, 1992, p. 171.
52. "Interstrand Cross-Linking of Duplex DNA by Nitrous Acid: Covalent Structure of the dG-to-dG Cross-Link at the Sequence 5'-CG," .J. Kirchner, Snorri Th. Sigurdsson, Paul B. Hopkins, *J. Am. Chem. Soc.* 1992, 114, 4022.
54. "Formaldehyde Preferentially Interstrand Cross-Links Duplex DNA through Deoxyadenosine Residues at the Nucleotide Sequence 5'-d(AT)," Huifang Huang, Marjorie S. Solomon, and Paul B. Hopkins, *J. Am. Chem. Soc.* 1992, 114, 9240 (communication).
55. "Covalent Structure of a Nitrogen Mustard-Induced DNA Interstrand Cross-Link: An N-7 to N-7 Linkage of Deoxyguanosine Residues at the Duplex Sequence 5'-d(GNC)," Stacia M. Rink, Marjorie S. Solomon, Matthew J. Taylor, Sharanabasava B. Rajur, Larry W. McLaughlin, Paul B. Hopkins, *J. Am. Chem. Soc.* 1993, 115, 2551.
56. "DNA Interstrand Cross-Linking Reactions of Pyrrole-Derived, Bifunctional Electrophiles: Evidence for a Common Target Site in DNA ," Jinsuk Woo, Snorri Th. Sigurdsson, and Paul B. Hopkins, *J. Am. Chem. Soc.* 1993, 115, 3407.
57. "Chemical Synthesis and Characterization of Duplex DNA Containing a New Base Pair: A Nondisruptive, Benzofused Pyrimidine Analog," Marjorie S. Solomon and Paul B. Hopkins, *J. Org. Chem.* 1993, 58, 2232.
58. "DNA Interstrand Cross-Linking by Reductively Activated FR900482 and FR66979," Jinsuk Woo, Snorri Th. Sigurdsson, and Paul B. Hopkins, *J. Am. Chem. Soc.* 1993, 115, 1199 (communication).
59. "DNA Interstrand Cross-Linking by Formaldehyde: Nucleotide Sequence Preference and Covalent Structure of the Predominant Cross-Link Formed in Synthetic Oligonucleotides," Huifang Huang and Paul B. Hopkins, *J. Am. Chem. Soc.* 1993,115, 9402.
61. "Affinity Interstrand and Intrastrand Cross-Linking of Duplex DNA by a Pyrrole-Distamycin Conjugate," Snorri Th. Sigurdsson, Stacia M. Rink, and Paul B. Hopkins, *J. Am. Chem. Soc.* 1993, 115, 12633 (communication).
62. "DNA Interstrand Cross-Linking by 2,5-(N,N-Diaziridinyl)-1,4-Benzoquinone: Nucleotide Sequence Preferences and Covalent Structure of the dG-to-dG Cross-Links at 5'-d(GNnC) in Synthetic Oligonucleotides," Stephen Alley, Kenneth Brameld, and Paul B. Hopkins, *J. Am. Chem. Soc.* 1994, 116, 2734.
63. "Covalent Structure of the DNA -DNA Interstrand Cross-Link Formed by Reductively Activated FR66979 in Synthetic DNA Duplexes," H. Huang, T. K. Pratum, and P. B. Hopkins, *J. Am. Chem. Soc.* 1994, 116, 2703.
64. "Ovothiols," Paul B. Hopkins and Tod P. Holler, *Methods in Enzymology* 1995, 252, 115 (invited contribution).
67. "Synthesis and Reactions with DNA of a Family of DNA-DNA Affinity Cross-Linking Agents," Snorri Thor Sigurdsson and Paul B. Hopkins, Tetrahedron 1994, 50, 12065.
68. "A Mechlorethamine-Induced Interstrand Cross-Link Bends Duplex DNA," Stacia M. Rink and Paul B. Hopkins, *Biochemistry* 1995, 34, 1439.
70. "FR66979 Requires Reductive Activation to Cross-Link DNA Efficiently," Huifang Huang, Scott R. Rajski, Robert M. Williams, and Paul B. Hopkins, *Tetrahedron Lett.* 1995, 35, 9669.
71. "DNA-DNA Interstrand Cross-Linking by cis-Diamminedichloroplatinum(II): N7(dG)-to-N7(dG) Cross-Linking at 5'-d(GC) in Synthetic Oligonucleotides," Huifang Huang, Jinsuk Woo, Stephen C. Alley and Paul B. Hopkins, *Bioorganic and Medicinal Chemistry* 1995, 3, 659. (invited contribution)
72. "A Probe for Sequence-Dependent Nucleic Acid Dynamics," T. R. Miller, S. C. Alley, A. Reese, M. S. Solomon, W. McCallister, C. Mailer, B. H. Robinson, and P. B. Hopkins, *J. Am. Chem. Soc.* 1995, 117, 9377.

74. "Solution Structure of $[d(CGCGAATTCGCG)]_2$ Containing an Interstrand Cross-Link Derived from a Distamycin-Pyrrole Conjugate," Patti A. Fagan, H.P. Spielmann, Snorri Th. Sigurdsson, Paul B. Hopkins, and David E. Wemmer, *Nucleic Acids Research* 1996, 24, 1566-73.
75. "Solution Structure of a Cisplatin-Induced DNA Interstrand Cross-Link," Huifang Huang, Leiming Zhu, Brian R. Reid, Gary P. Drobny and Paul B. Hopkins, *Science* 1995, 270, 1842.
78. "DNA-DNA Interstrand Cross-Linking by FR66979: Intermediates in the Activation Cascade," Manuel M. Paz and Paul B. Hopkins, *J. Am. Chem. Soc.* 1997, 119, 5999.
80. "Effect of Nucleosome Structure on DNA Interstrand Cross-Linking Reactions," Julie T. Millard, Rebecca J. Spencer, and Paul B. Hopkins, *Biochemistry* 1998, 37, 5211-5219.
81. "Chemical Synthesis and Preliminary Structural Characterization of a Nitrous Acid Interstrand Cross-Linked Duplex DNA," Eric A. Harwood, Snorri Th. Sigurdsson, N. B. Fredrik Edfeldt, Brian R. Reid, and Paul B. Hopkins, *J. Am. Chem. Soc.* 1999, 121, 5081-5082.
84. "Monoalkylation of DNA by Reductively Activated FR66979," Manuel M. Paz, Snorri Th. Sigurdsson, and Paul B. Hopkins, *Bioorganic and Medicinal Chemistry* 2000, 8, 173-179.
86. "Sequence-Dependent Dynamics in Duplex DNA," T.M. Okonogi, Stephen C. Alley, Annabelle W. Reese, Paul B. Hopkins, Bruce H. Robinson, *Biophysical Journal* 2000, 78, 2560-2571.
87. "Chemical Synthesis of Cross-Link Lesions Found in Nitrous Acid Treated DNA: A General Method for the Preparation of N2-Substituted 2'-Deoxyguanosines," Eric A. Harwood, Paul B. Hopkins, Snorri Th. Sigurdsson, *J. Org. Chem.* 2000, 65, 2959-2964.
89. "Phosphate Backbone Neutralization Increases Duplex DNA Flexibility: A Model for Protein Binding," Tamara M. Okonogi, Stephen C. Alley, Eric. A. Harwood, Paul B. Hopkins, and Bruce H. Robinson, *Proceedings of the National Academy of Sciences*, 2002, 99, 4156-4160.
90. "Sequence-Dependent Dynamics of Duplex DNA: The Applicability of a Dinucleotide Model," T.M. Okonogi, S. C. Alley, A. W. Reese, P. B. Hopkins, and B. H. Robinson, *Biophysical Journal* 2002, 83, 3446-3459.
91. "Solution Structure of a Nitrous Acid Induced DNA Interstrand Cross-Link," Fredrik Edfeldt, Eric Harwood, Snorri Sigurdsson, Paul Hopkins, and Brian Reid, *Nucleic Acids Research* 2004, 32, 2785-2794.
92. "Sequence Context Effect on the Structure of Nitrous Acid Induced DNA Interstrand Cross-Links," F. Edfelt, E. Harwood, S. Sigurdsson, P. Hopkins, and B. Reid, *Nucleic Acids Research* 2004, 32, 2795-2801.

VI. Grant Activity:

From 1983 until 2005, I was PI or co-PI on some 30 grants supporting research or equipment acquisitions, from the following agencies: Procter and Gamble, Petroleum Research Fund, Research Institute of Scripps Clinic, Research Corporation, American Cancer Society, Searle Scholars Program, National Institutes of Health, National Science Foundation, Alfred P. Sloan Foundation, Graduate School Research Fund, Office of Naval Research, and the American Chemical Society.

VII. Honors and Awards:

Phi Beta Kappa (1976); National Science Foundation Predoctoral Fellow (1977-80); Dreyfus Grant for Newly Appointed Distinguished Faculty in Chemistry (1982-87); Searle Scholar (1984-87); Science Digest List of "America's 100 Brightest Scientists under 40" (1984); ICI Award Recipient (1988); Fellow, Alfred P. Sloan Foundation (1988-90); National Institutes of Health Research Career Development Award (1988-93); American Chemical Society Arthur C. Cope Scholar Award (1992); North Central High School Alumni Hall of Fame (1992); Brown Outstanding Young Organic Chemist Lecturer, Purdue University (1994); AAAS Fellow (1997); Leon Johnson Endowed Professor of Chemistry (2010)

VIII. Additional Comments on Research, Teaching, and Service:

National Service: Co-Chairman, National Science Foundation Workshop on Organic Synthesis and Natural Products Chemistry (1988-90); Ad Hoc Reviewer, NIH Bioorganic and Natural Products Study Section (1988); NSF Postdoctoral Fellowship Selection Panel (1991); NIAID National Cooperative Drug Discovery Groups for the Treatment of Human Immunodeficiency Virus Infection Study Section (1992); NIH Chemistry-Biology Interface Predoctoral Training Program Selection Panel (1993); Member, Editorial Advisory Board, *Chemical Research in Toxicology* (1994-96); External Advisor, Training Grant in Drug and Carcinogen-DNA Interactions, Purdue University (1994); NIH Bioorganic and Natural Products Study Section (1994-97); Coordinator, National Chemistry Faculty Salary Survey (1995-2010); External Reviewer, Physical and Mathematical Sciences, UC Irvine (2000); Governing Board, Council for Chemical Research (2000-02); Governing Board Nominating Committee, Council for Chemical Research (2003); External Reviewer, Department of Chemistry, University of Toronto (2007)

Consulting: NeoRx, Seattle, Washington (1987); Parke-Davis, Ann Arbor, Michigan (1992-94); ISIS Pharmaceutical, Carlsbad, CA (1993-94); Darwin Molecular, Seattle, WA (1993-94)

Summary of Selected Professional Activities

*(Maximum Length: **Four** Pages)*

Name: **Samson A. Jenekhe** Date of Revised Vitae: **6/10/2011**

Rank: **Professor** Date of Ph.D.: **1985** Date of UW hire: **2000** Date of last promotion: **N/A**

I. Courses Taught (course number & times taught):

CHEM 162 (6)
CHEM 152 (1)
CHEM 585 (1)

II. Department and University Service:

Departmental Committees:

Faculty Recruiting Committee, 2003-04

College and University Committees:

College of Engineering, Standing Endowment Committee (SEC), 2007-present
Department of Electrical Engineering, Close Professorship Committee, 2007-2009
Department of Materials Science & Engineering, Faculty Recruiting Committee, 2007-2010
Department of Chemical Engineering, Strategic Plan Committee, 2006-2009
Department of Chemical Engineering, Awards and Professional Progress Committee, Chair, 2001-2009
Department of Chemical Engineering, Faculty Recruiting Committee, Chair, 2004-2010
Department of Chemical Engineering, Faculty Recruiting Committee, 2001-2002

22 Total Other Graduate Supervisory Committees: (does not include students in own group)

III. Research Group (current):

5	graduate students	**4**	Postdoctoral associates	**17**	Ph.D.s granted (career total)
2	undergraduate students		other Visiting Faculty		

IV. Invited Lectures: career total **190**

Selected lectures:

1. "Organic Photovoltaics: Towards Low Cost Solar Energy," Invited Seminar, Purdue University, School of Chemical Engineering, West Lafayette, IN, May 4, 2011.
2. "Organic Photovoltaics: Towards Low Cost Solar Energy," Invited Seminar, Oklahoma State University, Joint Department of Chemistry and School of Chemical Engineering Seminar, Stillwater, OK, April 12, 2011.
3. "Organic Photovoltaics: Towards Low Cost Solar Energy," Invited Seminar, University of Houston, Department of Chemistry, Houston, TX, March 23, 2011.
4. "Donor-Acceptor Copolymer Semiconductors for Efficient Solar Cells," Invited Talk, 239th ACS National Meeting, San Francisco, CA, March 21-25, 2010.
5. "Polymer Semiconductor Nanostructures for Electronic and Solar Energy Applications," Invited Talk, 239th ACS National Meeting, San Francisco, CA, March 21-25, 2010.
6. "Polymer Semiconductor Nanostructures for Electronic and Solar Energy Applications," Invited Talk, Material Research Society (MRS), San Francisco, CA, April 5-9, 2010.
7. "New Polymer Semiconductors for Solar Cells," Invited Talk, 4th Solvay-COPE Symposium on Organic Electronics, Brussels, Belgium, May 6-7, 2010.
8. "High Performance Polymer Solar Cells: Tailoring Materials and Devices," Invited Talk, International Symposium on Functional Pi-Electron Systems, Atlanta, GA, May 23-28, 2010.
9. "High Performance Polymer Solar Cells: Tailoring Materials and Devices," Invited Talk, International Conference of Science and Technology of Synthetic Metal (ICSM), Kyoto, Japan, July 4-9, 2010.
10. **"**Diblock Copoly(3-alkythiophene)s: Synthesis, Self-Assembly and Their Uses in Photovoltaic Cells," Invited Talk, Material Research Society (MRS), Boston, MA, November 29-December 2, 2010.
11. "New copolymer semiconductors for high performance solar cells," Invited Talk, 2010 International Chemical Congress of Pacific Basin Societies (Pacifichem), Honolulu, HI, December 15-20, 2010.

12. "Polymer Semiconductor-Based Electronics and Solar Cells," Invited Seminar, University of Alberta, Department of Chemistry, Edmonton, AB, Canada, November 19, 2009.
13. "Polymer Semiconductor-Based Electronics and Solar Cells," Invited Seminar, University of Calgary, Department of Chemistry, Calgary, AB, Canada, November 20, 2009.
14. "Polymer-Based Organic Field-Effect Transistors," Invited 4-hr Lecture, International Workshop on Conducting Polymers 2009, Prague, Czech Republic, September 13-18, 2009.

V. Publications: career total **275** in press **3** submitted **5** book chapters, reviews **6**

Selected publications:

1. Kim, F. S.; Guo, X.; Watson, M. D.; Jenekhe, S. A. "High-Mobility Ambipolar Transistors and High-Gain Inverters from a Donor-Acceptor Copolymer Semiconductor," *Adv. Mater.* **2010**, *22*, 478-482.
2. Wu, P.-T.; Ren, G.; Kim, F. S.; Li, C.; Mezzenga, R.; Jenekhe, S. A. "Poly(3-hexylthiophene)-*b*-poly(3-cyclohexylthiophene): Synthesis, Microphase Separation, Thin Film Transistors, and Photovoltaic Applications," *J. Polym. Sci. Part A: Polym. Chem.* **2010**, *48*, 614-626.
3. Ren, G.; Wu, P.-T.; Jenekhe, S. A. "Enhanced Performance of Bulk Heterojunction Solar Cells Using Block Copoly(3-alkylthiophene)s," *Chem. Mater.* **2010**, *22*, 2020-2026.
4. Wu, P.-T.; Ren, G.; Jenekhe, S. A. "Crystalline Random Conjugated Copolymers with Multiple Side Chains: Tunable Intermolecular Interactions and Enhanced Charge Transport and Photovoltaic Properties," *Macromolecules* **2010**, *43*, 3306-3313.
5. Xin, H.; Reid, O. G.; Ren, G.; Kim, F. S.; Ginger, D. S.; Jenekhe, S. A. "Polymer Nanowire/Fullerene Bulk Heterojunction Solar Cells: How Nanostructure Determines Photovoltaic Properties," *ACS Nano* **2010**, *4*, 1861-1872.
6. Noone, K. M.; Strein, E.; Anderson, N. C.; Wu, P.-T.; Jenekhe, S. A.; Ginger, D. S. "Broadband Absorbing Bulk Heterojunction Photovoltaics Using Low-Bandgap Solution-Processed Quantum Dots," *Nano Lett.* **2010,** *10*, 2635-2639.
7. Ahmed, E.; Earmme, T.; Ren, G.; Jenekhe, S. A. "Novel n-Type Conjugated Ladder Heteroarenes: Synthesis, Self-Assembly of Nanowires, Electron Transport and Electroluminescence of Bisindenoanthrazolines," *Chem. Mater.* **2010**, *22*, 5786-5796.
8. Wang, C.; Kim, F. S.; Ren, G.; Xu, Y.; Pang, Y.; Jenekhe, S. A.; Jia, L. "Regioregular Poly(3-alkanoythiophene): Synthesis and Electrochemical, Photophysical, Charge Transport, and Photovoltaic Properties," *J. Polym. Sci. Part A: Polym. Chem.* **2010**, *48*, 4681-4690.
9. Reid,O. G.; Xin, H.; Jenekhe, S. A.; Ginger, D. S. "Nanostructure Determines the Intensity-Dependence of Open-Circuit Voltage in Plastic Solar Cells," *J. Appl. Phys.* **2010,** *108*, 084320.
10. Earmme, T.; Ahmed, E.; Jenekhe, S. A. "Solution-Processed Highly Efficient Blue Phosphorescent Polymer Light-Emitting Diodes Enabled by a New Electron Transport Material," *Adv. Mater.* **2010**, *22*, 4744-4748.
11. Kim, F. S.; Ahmed, E.; Subramaniyan, S.; Jenekhe, S. A. "Air-Stable Ambipolar Field-Effect Transistors and Complementary Logic Circuits from Solution-Processed n/p Polymer Heterojunctions," *ACS Appl. Mater. Interfaces.* **2010**, *2*, 2974-2977.
12. Zhu, L.; Kim, E.-G.; Yi, Y.; Ahmed, E.; Jenekhe, S. A.; Coropceanu, V.; Bredas, J.-L. "Charge-Transport Properties of the Tetraphenylbis(indolo[1,2-*a*]quinoline) and 5,7-Diphenylindolo[1,2-*a*]quinoline Crystals," *J. Phys. Chem. C* **2010**, *114*, 20401-20409.
13. Kim, F. S.; Ren, G.; Jenekhe, S. A. "One-Dimensional Nanostructures of π-Conjugated Molecular Systems: Assembly, Properties, and Applications from Photovoltaics, Sensors, and Nanophotonics to Nanoelectronics," *Chem. Mater.* **2011**, *23*, 682-732 (**Invited Review**).
14. Guo, X.; Xin, H.; Kim, F. S.; Liyanage, A. D. T.; Jenekhe, S. A.; Watson, M. D. "Thieno[3,4-*c*]pyrrole-4,6-dione-Based Donor-Acceptor Conjugated Polymers for Solar Cells," *Macromolecules* **2011**, *44*, 269-277.
15. Ren, G.; Wu, P.-T.; Jenekhe, S. A. "Solar Cells Based on Block Copolymer Semiconductor Nanowires: Effects of Nanowire Aspect Ratio," *ACS Nano* **2011**, *5*, 376-384.
16. Zhang, X.; Shim, J. W.; Tiwari, S. P.; Norton, J. E.; Wu, P.-T.; Barlow, S.; Jenekhe, S. A.; Kippelen, B.; Brédas, J. L.; Marder, S. R. "Dithienopyrrole-Quinoxaline/Pyridopyrazine Donor-Acceptor Polymers: Synthesis and Electrochemical, Optical, Charge-Transport, and Photovoltaic Properties," *J. Mater. Chem.* **2011**, *21*, 4971-4982.

17. Guo, Z.; Jenekhe, S. A.; Prezhdo, O. V. "Towards Non-Excitonic Organic Solar Cells: Electronic Structure and Spectra of Novel Semiconducting Donor-Acceptor Block Copolymers," *Phys. Chem. Chem. Phys.* **2011**, *13*, 7630-7636.
18. Newbloom, G. M.; Kim, F. S.; Jenekhe, S. A.; Pozzo, D. C. "Impact of Mesoscale Morphology on Charge Transport in Colloidal Networks of Poly(3-hexylthiophene)," *Macromolecules* **2011**, *44*, 3801-3809.
19. Subramaniyan, S.; Xin, H.; Kim, F. S.; Shoaee, S.; Durrant, J. R.; Jenekhe, S. A. "Effects of Side Chains on Thiazolothiazole-Based Copolymer Semiconductors for High Performance Solar Cells," *Adv. Energy Mater.* **2011**, *in press*.
20. Ahmed, E.; Earmme, T.; Jenekhe, S. A. "New Solution-Processable Electron Transport Materials for Highly Efficient Blue Phosphorescent OLEDs," *Adv. Funct. Mater.* **2011**, *in press*.

VI. Grant Activity:

Current:

1. Project: Hybrid Semiconductors: Overcoming the Excitonic Bottleneck in low-cost Solar Cells
   Start: 9/01/10 — End: 8/31/13
   Funding Source: **NSF** — Role: PI
   Status: Current — Total Costs: **$1,600,000.**
2. Project: *Molecular and Nanoscale Engineering of High Efficiency Excitonic Solar Cells*
   Start: 9/01/07 — End: 8/31/13
   Funding Source: **DOE BES** — Role: PI (with co-PIs: Ginger and Cao)
   Status: Current — Total Costs: **$2,250,000.**
3. Project: *Organic Semiconductors for Printable Electronics*
   Start: 1/01/09 — End: 12/31/11
   Funding Source: **Solvay North America, Inc.** — Role: PI
   Status: Current — Total Costs: **$1,134,706.**
4. Project: *n-Type and Ambipolar Polymer Semiconductors*
   Start: 6/1/08 — End: 5/31/12
   Funding Source: **NSF** — Role: PI
   Status: Current — Total Costs: **$340,000.**
5. Project: *n-Type Materials for Solar Cells*
   Start: 1/01/11 — End: 12/31/13
   Funding Source: **ONR** — Role: PI
   Status: Current — Total Costs: **$417,249.**
6. Project: *Solution-Processable Materials for Organic Light-Emitting Diodes*
   Start: 7/15/11 — End: 7/14/13
   Funding Source: **Solvay North America, Inc.** — Role: PI
   Status: Current — Total Costs: **$602,408.**

VII. Honors and Awards:

Named among "Top Materials Scientists of the Past Decade, 2000-2010," Thomson Reuters' *Science Watch,* March 2011
Fellow, American Physical Society, 2003
Fellow, American Association for the Advancement of Science, 2003
Boeing-Martin Professor of Engineering, University of Washington, 2000
Honeywell Star Inventor Award, 1986
Tau Beta Pi, National Engineering Honor Society, 1976

VIII. Additional Comments on Research, Teaching, and Service:

My UW appointment is 1/3 Department of Chemistry (College of Arts & Sciences) and 2/3 Department of Chemical Engineering (College of Engineering). Only courses taught in the Department of Chemistry are listed.

Summary of Selected Professional Activities

Name: Sarah L. Keller — Date of Revised Vitae: 2011
Rank: Professor — Date of Ph.D.: 1995 — Date of UW hire: 2000 — Date of last promotion: 2009

I. Courses Taught (only list course number & times taught, e.g. "CHEM 142 (12)"):

Chem 144 (1)
Chem 155 (2)
Chem 162 (1)
Chem 452 (14)
Chem 461 (2)
Chem 585 (2)

I've also taught Chem 590, Chem 399/499, Phys 401/402, Chem 600/800, Phys 600/800 (not included here).

II. Department and University Service:

Departmental Committees:

Physical Chemistry Second-Year Graduate Exam Committee, 2003, 2007, 2010-Chair
Physical Chemistry Faculty Search Committee, 2004-2008, (Chair, 2005-2006)
Physical Chemistry First-Year Graduate Advisor, 2007-2008
Physical Chemistry Seminar Organizer, Spring 2000, Fall 2003, Fall 2004, Fall 2005
Physical Chemistry Subcommittee to Assess Undergraduate Mathematics Preparation, Fall 2003
Chemistry Dept. Graduate Student Colloquium Chair, 2000-2004, 2006
Chemistry Dept. Graduate Student Recruiting Committee, 2000-2005

College and University Committees:

UW Associate Dean for Research Activities for the College of Arts and Sciences, 2010-present
UW Office of Research Proposal Review Committee, 2010-present
UW Molecular Biophysics NIH Training Grant Selection Committee, 2008, 2010
UW College of Arts and Sciences Curriculum Committee, 2009-2010
UW Panel to advise Academy of Young Scholars, Sept. 28, 2009
UW Collegium on Large Classroom Instruction, Sept. 23, 2009
UW ADVANCE Workshop to advise junior faculty, May 29, 2008
UW Honors Program Panel on balancing family and career, Feb. 28, 2008
UW Panel to advise new UW faculty, Feb. 20, 2008
UW "Leadership Lunch" Speaker, advising science/engineering students and postdocs, Nov. 2, 2007
UW Graduate School Panel to advise postdocs on careers and family, May 30, 2007
UW Committee to Evaluate the Dean of Arts and Sciences, David Hodge, 2005
UW Faculty Connections Advising of Freshmen, Aut 2004, and Transfer Students, Spring 2005
UW Mentoring Presentation to Alpha Chi Sigma (2003), to UW Undergrad Research Society (2002), and to UW Nanotech Student Association (2002)

25	Total Other Graduate Supervisory Committees: (does not include students in own group)

III. Research Group (current):

3	graduate students	1	Postdoctoral associates	4	Ph.D.s granted (career total)
1	undergraduate students		other Visiting Faculty	5	M.S.s granted (career total)

IV. Invited Lectures: career total 118 — 92 In last 10 years

Sample of more prominent invited conference presentations since 2001:

- Biophysics of Membrane Transformations (Bad Honnef, Germany), Oct. 26-30, 2010.
- Physical Chemistry of Biointerfaces (San Sebastian, Spain), July 19-24, 2010.
- ISWOLD Workshop on Lipid Domains (Rehovot, Israel), accepted for Mar. 8-12, 2010.
- Gordon Research Conference on Soft Condensed Matter Physics, Aug. 9-13 2009.
- Gordon Research Conference on Molecular Membrane Biology, Jul. 5-9 2009.
- Royal Society of Chemistry / Institute of Physics, Meeting on Phase Separation and Mixing, Plenary Lecture (Trinity College, Cambridge), Sept. 3-5 2008.
- FASEB Summer Conference, Molecular Biophysics of Cell Membranes, Jul. 19-24 2008.
- Nonequilibrium Soft Matter Physics Symposium, (Tokyo, Japan), Mar. 17-19 2008.
- Keystone Symposium, Molecular Basis for Biological Membrane Organization, Jan. 13-16 2008.
- Berkeley Statistical Mechanics Meeting, Jan. 11-13 2008.
- Sci Foo Camp (Googleplex, CA), Aug. 3-4 2007.

- Bio-Systems Conference, MPI Colloids and Interfaces (Germany), June 27 2006.
- Australian Society for Biophysics Meeting, (Canberra, Aus), Sept. 29 2005.
- Gordon Research Conference on Liquid Crystals, June 19 2005.
- Gordon Research Conference on Chemistry of Supramolecules and Assemblies, June 15 2005.
- Physics of Soft Matter Complexes (Tokyo, Japan), Nov 30 2004.
- 2004 Asilomar Biophysical Discussions, Oct. 2004.
- FASEB Summer Research Conference, Jul. 2004.
- ACS German-American Frontiers of Chemistry Symposium (Kloster Seeon, Germany), Jul. 2004.
- Newton Institute Programme: Statistical Mechanics of Molecular and Cellular Biological Systems (Cambridge University, UK), May 2004.
- National Academy of Sciences: Japanese-American Frontiers of Science Symposium, (Kanagawa, Japan), Dec. 2003.
- National Academy of Sciences: Japanese-American Frontiers of Science Symposium, Dec. 2002.
- Statphys 21 Satellite: Current Problems in Complex Fluids (Oaxaca, Mexico), Jul. 2001.

Sample of more prominent invited <u>university/institute</u> presentations since 2001:

- Physical Chemistry Seminar, UC Berkeley, Mar. 15 2011.
- Princeton Inst. for Science and Technology of Materials, Princeton University, Apr. 21 2010.
* Cornell University Medical School, Nov. 12 2008.
* Center for Self Assembly Seminar, McGill University, Apr. 22 2008.
- Bioquant Seminar, Deutsches Krebsforschungszentrum, Heidelberg, Nov 20 2007.
- Condensed Matter Seminar, University of California, Los Angeles, May 21 2007.
- Chemistry Seminar, Imperial College (England), May 15 2007.
- CIC BiomaGUNE, San Sebastian (Spain), May 10 2007.
- Graduate Student Hosted Seminar, Stanford University, Chemistry Dept., Apr. 5 2007.
- Condensed Matter Seminar, Max Born Institute (Berlin), June 29 2006.
- Condensed Matter Seminar, Univ. of Massachusetts Amherst, Physics Dept., Mar. 31 2005.
- Condensed Matter Seminar, Harvard University, DEAS, Mar. 29 2005.
- Seminar, MPI für Polymerforschung, Mainz (Germany), Jul. 19 2004.
- Department Colloquium, University of Virginia, Chemistry Dept., Apr. 2 2004.
- Joint CBIMMS and CBTE Seminar, Duke University, Apr. 1 2004.
- Biophysics Seminar, Cornell University, Mar. 17 2004.
- Condensed Matter Seminar, Northwestern University, Physics Dept., Mar. 11 2004.
- Seminar, University of Chicago, Institute of Biological Dynamics, Mar. 9 2004.
- Special Seminar, Nagoya University (Japan), Dept. of Biological Science, Dec. 11 2003.
- Physical Chemistry Seminar, UC Berkeley, Chemistry Dept., Apr. 1 2003.
- Polymer Science and Engineering Seminar, UMass Amherst, Mar. 21 2003.
- Advances in Soft Matter Seminar, UCLA, Chemistry Dept., May 31 2002.

V. Publications: career total [36] in press [ ] submitted [1] book chapters, reviews [2]

25 Peer-reviewed publications in the past decade are below:

- A.R. Honerkamp-Smith and S.L. Keller, <u>Dynamic Critical Exponent in a 2D Membrane with Conserved Order Parameter</u>, (submitted *Phys. Rev. Lett.),* 2011.

- M.M. Stevens, A.R. Honerkamp-Smith and S.L. Keller, <u>Solubility Limits of Cholesterol, Lanosterol, Ergosterol, Stigmasterol and β-Sitosterol in Electroformed Lipid Vesicles</u> *Soft Matter*, 6, 5882-5890, 2010. (Cover article) <10

- A.R. Honerkamp-Smith, S.L. Veatch, and S.L. Keller, <u>An Introduction to Critical Points for Biophysicists: Observations of Compositional Heterogeneity in Lipid Membranes</u>, *Biochim. Biophys. Acta. (Invited),* 1788, 53-63, 2009. (Cover article) (**25 citations)**

- A.R. Honerkamp-Smith, P. Cicuta, M.D. Collins, S.L. Veatch, M. den Nijs, M. Schick, and S.L. Keller, <u>Line Tensions, Correlation Lengths, and Critical Exponents in Lipid Membranes near Critical Points</u>, *Biophys. J.*, 95, 236-246, 2008. (**58 citations)**

- M.D. Collins and S.L. Keller, <u>Tuning Lipid Mixtures to Induce Domains across Leaflets of Unsupported Asymmetric Bilayers</u>, *PNAS*, 105, 124-128, 2008. (**55 citations)**

- M. Halter, Y. Liao, R.M. Plocinik, D.C. Coffey, S. Bhattacharjee, U. Mazur, G.J. Simpson, B.H. Robinson and S.L. Keller, <u>Molecular Self-Assembly of Mixed High-beta Zwitterionic and Neutral Ground State NLO Chromophores</u>, *Chemistry of Materials*, 20,1778-1787, 2008. (**11 citations)**

- S.L. Veatch, O. Soubias, S.L. Keller, and K. Gawrisch, <u>Critical Fluctuations in Domain-Forming Lipid Mixtures</u>, *PNAS*, 104, 17650-17655, 2007. (**71 citations)**

• P. Cicuta, S.L. Keller, and S.L. Veatch, Diffusion of Liquid Domains in Lipid Bilayer Membranes, *J. Phys. Chem. B,* 111, 3328-3331, 2007.	(**60 citations)**
• S.L. Veatch, K. Gawrisch, and S.L. Keller, Closed-loop Miscibility Gap and Quantitative Tie-Lines in Ternary Membranes Containing Diphytanoyl PC, *Biophys. J.,* 90, 4428-4436, 2006.	(**55 citations)**
• B.L. Stottrup and S.L. Keller, Phase Behavior of Lipid Monolayers Containing DPPC and Cholesterol Analogs, *Biophys. J.,* 90, 3176-3183, 2006.	(**32 citations)**
• S.L. Keller and A.L. Smith, Advice for New Faculty Teaching Undergraduate Science, *J. Chem. Educ.*, 83, 401-406, 2006.	<10
• S.L. Veatch and S.L. Keller, Seeing Spots: Complex Phase Behavior in Simple Membranes, *Biochim. Biophys. Acta (Invited),* 1746, 172-185, 2005. (Cover article)	(**206 citations)**
• M.E. Beattie, S.L. Veatch, B.L. Stottrup, and S.L. Keller, Sterol Structure Determines Miscibility vs. Melting Transitions in Lipid Vesicles, *Biophys. J*., 89, 1760-1768, 2005.	(**44 citations)**
• S.L. Veatch and S.L. Keller, Miscibility Phase Diagrams of Giant Vesicles Containing Sphingomyelin, *Phys. Rev. Lett.*, 94, 148101, 2005.	(**141 citations)**
• B.L. Stottrup, D.S. Stevens, and S.L. Keller, Miscibility of Ternary Mixtures of Phospholipids and Cholesterol in Monolayers, and Application to Bilayer Systems, *Biophys. J* ., 88, 269-276, 2005.	(**46 citations)**
• S.L. Veatch, I.V. Polozov, K. Gawrisch, and S.L. Keller, Liquid Domains in Vesicles Investigated by NMR and Fluorescence Microscopy, *Biophys. J* ., 86, 2910-2922, 2004.	(**184 citations)**
• B.L. Stottrup, S.L. Veatch, and S.L. Keller, Nonequilibrium Behavior in Supported Lipid Membranes Containing Cholesterol, *Biophys. J* ., 86, 2942-2950, 2004.	(**64 citations)**
• S.L. Keller, Sequential Folding of a Rigid Wire into Three-Dimensional Structures, *Am. J. Phys*., 72, 599-604, 2004.	<10
• S.L. Veatch and S.L. Keller, Separation of Liquid Phases in Giant Vesicles of Ternary Mixtures of Phospholipids and Cholesterol, *Biophys. J* ., 85, 3074-3083, 2003.	(**342 citations)**
• S.L. Veatch and S.L. Keller, A Closer Look at the Canonical Raft Mixture in Model Membrane Studies, *Biophysical J.* 84, 725-726, 2003.	(**62 citations)**
• S.L. Keller, Miscibility Transitions and Lateral Compressibility in Liquid Phases of Lipid Monolayers, *Langmuir, **(Invited)*** 19, 1451-1456, 2003.	(**13 citations)**
• S.L. Veatch and S.L. Keller, Organization in Lipid Membranes Containing Cholesterol, *Phys. Rev. Lett.* 89, 268101, 2002.	(**223 citations)**
• S. Bezzine, J.G. Bollinger, S.L. Veatch, S.L. Keller, and M.H. Gelb, On the Binding Preference of Secreted Phospholipases A2 for Membranes with Anionic Phospholipids, *J. Biol. Chem.* 277, 48523-48534, 2002.	(**59 citations)**
• S.L. Keller, Coexisting Liquid Phases in Lipid Monolayers and Bilayers, *J. Phys.: Condensed Matter (Special Issue Article - **Invited**)* 14, 4763-4766, 2002.	<10
• W.H. Pitcher III, S.L. Keller, and W.H. Huestis, Interaction of Nominally Soluble Proteins with Phospholipid Monolayers at the Air-Water Interface. *Biochim. Biophys.Acta* 1564, 107-113, 2002.	<10

VI. Grant Activity:

CURRENT:

National Science Foundation MCB-0744852	2008-2013	$820,000

PAST:

REU Supplement to NSF MCB-0744852	2009, 2010	$12,000
Summer Salary (NIH ARRA to Sharona Gordon, PI, UW PBio)	2010-2011	$37,000
Eppley Foundation	2009-2010	$19,000
Cottrell Teacher Scholar Award	2003-2008	$75,000
National Science Foundation CAREER Award MCB-0133484	2002-2007	$645,000
Research Innovation Award, Research Corporation	2002-2006	$35,000

VII. Honors and Awards:

Avanti Young Investigator in Lipid Research - ASBMB	2010
Proposal Review Panel: NSF Molecular Biophysics (BIO Directorate)	2009
Haines Annual Lecture in Biochemistry - Wabash College	2008
Distinguished Teaching Award - University of Washington	2006
Margaret Oakley Dayhoff Research Award - Biophysical Society	2005
Annual Five Colleges Lecturer "What's New in Physics" - Smith College	2005
Outstanding Teaching Award - UW Department of Chemistry	2004
Cottrell Scholar Award	2003
Proposal Review Panel: NSF Molecular Biophysics (BIO Directorate)	2003
NSF CAREER Award	2002
Research Innovation Award (Research Corporation)	2001

VIII. Additional Comments on Research, Teaching, and Service:

I have mentored my group members in writing their own applications for grants and awards. Below are the awards and fellowships they've landed over the last decade (those won before and/or after being in my group are not listed):

Awards to Keller-Group Postdoctoral Fellows while at UW:
NIH Kirschstein Postdoctoral Fellowship, UW-MDITR STC Postdoctoral Travel Grant, Sackler Fellow in Integrative Biophysics, Fondation Bettencourt Schueller Prix pur les Jeunes Chercheurs.

Awards to Keller-Group PhD Students at UW:
Biophysical Society Student Research Achievement Award,
2011 College of Arts and Sciences Graduate Dean's Medal for the Natural Sciences Division,
Anna Louise Hoffman National Award for Outstanding Graduate Research in Chemistry (Iota Sigma Pi),
UW Henderson Prize, UW Karrer Prize for best PhD thesis, UW Nanotechnology Fellowship (x3),
UW Molecular Biophysics Fellowship (x2), UW Rabinovitch Graduate Student Fellowship,
UW Natt-Lingafelter Award, UW Rowland Fellowship in Chemistry, Honen Fellowship,
Award for Best Presentation at UW CNT Student Symposium
Fellowship to Boulder Summer School for Complex Fluids and Biological Materials,
Best Poster Award and Travel Award to the NATO Biophysics Summer School in Edinburgh,
Best Poster Award and Travel Award to Geilo (Norway) Advanced Study Winter School.
Travel Awards: to 2009 Gordon Conference on Soft Condensed Matter Meets Biology,
to Chemistry Education Research Conference, to Biophysical Society Conference (x4),
to American Society for Cell Biology Conference (x2)

Awards to Keller-Group Masters Students at UW:
UW GK-12 Fellowship (x2), UW Natt-Lingafelter Award,
Puget Sound Society for Technical Communication Scholarship.

Awards to Keller-Group Undergraduate Researchers at UW:
UW Mary Gates Research Fellowship (x3), NSF REU (x3), Merck Index Award,
UW Arts and Sciences Undergraduate Research Fellowship, UW Space Grant Summer Research Scholar.

National/International Service (beyond journal and grant proposal reviews):
National Academy of Science, Frontiers of Science Symposium Organizer, Japan 2003
American Chemical Society, Symposium Organizer for Northwest Meeting, 2001
American Physical Society, Nominating Committee 2000-2001
Renaissance Weekend seminar on 21st Century Energy Issues, Dec. 31, 2009
NSF ADVANCE Workshop to advise future faculty (Rice Univ.), Oct. 6, 2008

Sample Student Course Evaluations: CHEM 452 (Thermodynamics for Biochemists)

Adjusted Evaluations (corrected for grade given, etc.)

	Win '01	Aut '01	Win '02	Aut '02	Win '03	Aut '03	Win '04	Aut '04	Aut '05	Aut '06	Win '07	Win '08	Win '10	Aut '10
1. Course as a whole	*4.3*	*4.4*	*4.3*	*4.6*	*4.4*	*4.5*	*4.7*	*4.5*	*4.9*	*4.4*	*4.7*	*4.9*	*4.7*	*4.9*
2. Course content	*4.2*	*4.3*	*4.1*	*4.4*	*4.3*	*4.4*	*4.3*	*4.3*	*4.7*	*4.2*	*4.4*	*4.7*	*4.4*	*4.6*
3. Instructor contribution	***5.1***	***5.1***	***4.9***	***5.3***	***5.1***	***5.1***	***5.1***	***5.2***	***5.3***	***5.2***	***5.0***	***5.1***	***5.2***	***5.2***
4. Instructor effectiveness	***4.9***	***5.1***	***4.7***	***5.3***	***5.1***	***5.0***	***5.1***	***5.1***	***5.3***	***5.2***	***5.1***	***5.1***	***5.2***	***5.2***
Combined items 1-4	*4.6*	*4.8*	*4.5*	*5.0*	*4.8*	*4.8*	*4.0*	*4.9*	*5.1*	*4.8*	*4.9*	*5.0*	*5.0*	*5.0*

5 = excellent; 4 = very good; 3 = good; 2 = fair; 1 = poor

Summary of Selected Professional Activities

Name: **Julia A. Kovacs** Date of Revised Vitae: **6/16/11**
Rank: **Professor** Date of Ph.D.: **1986** Date of UW hire: **1988** Date of last promotion: **9/01**

I. Courses Taught ((~enrollment) x number of times taught):

Chem 150, Freshman Chemistry (~290) x 8
Chem 162, Freshman Chemistry (~290) x 3
Chem 164, Honors Freshman Chemistry (~70) x 1
Chem 312, Inorganic Chemistry (~120) x 11
Chem 317, Inorganic Lab (~20-50) x 3
Chem 399, Undergrad. Research (~1) x 22
Chem 416, Transition Metals (~70) x 11
Chem 419, Bioinorganic Chemistry (~25) x 8
Chem 499, Undergrad. Research & Report Writing (~1) x 13
Chem 510, Current Problems in Inorganic Chemistry (~20) x 4
Chem 590, General Seminars (~250) x 7
Chem 591, Inorganic Seminars (~80) x 9
Chem 600, Independent Research (~6) x 60

II. Department and University Service: (selected, 2001-present)

Departmental Committees:

Inorganic Faculty Search Committee (2010-11), Chair (2007-08); Graduate Applications and Recruiting Committee (2007-present); Research Services Committee (2000-04, 2009-present); Space Committee (2003-04; 2006-07); Graduate Student Department Colloquium Organizer (2004-06); Chair's Advisory Committee (2004-06); Academic Personnel Committee (2004-05); Awards Committee (2003-04); Graduate Good Standing & Fellowships Committee (2000-03); Faculty Search Oversight Committee (2000-01)

College and University Committees:

Department of Biology Chair Search Committee (2004-05)

60 Total Other Graduate Supervisory Committees: (*last ten years; does not include students in own group*)

III. Research Group (current):

5 graduate students
1 undergraduate students
0 Postdoctoral associates
0 other Visiting Faculty
14 Ph.D.s granted (career total)

IV. Invited Lectures: *career total* 78

2001-present:

2011 Plenary speaker, 15th International Conference on Biological Inorganic Chemistry (ICBIC), Vancouver, BC, Canada (Aug. 7-12); Saunders Endowed Lecturer, Texas Christian University, Fort Worth, TX (Sept. 15-16), Harvard University (Apr. 15); University of California–Irvine (Mar. 3).

2010 "Molecular Design of Bioinorganic Chemistry" symposium, International Chemical Congress of Pacific Basin Societies (Pacifichem), Honolulu, HI (Dec. 10-15).

2009 14th International Conference on Biological Inorganic Chemistry (ICBIC), Nagoya, Japan (July); "Ken Karlin Cotton Award" symposium, 237th National Meeting of the American Chemical Society, Salt Lake City, UT (Mar. 22-26).

2008 University of Connecticut, R.T. Major Lecture Series (Oct. 15-16); International Symposium on Advanced Science and Biotechnology, Osaka, Japan (Mar. 22-23); "Dioxygen Activation by Metalloenzymes and Models" symposium, Nagoya, Japan (Mar. 19-21); Tohoku University, Sendai, Japan (Mar. 18); University of Oregon (Feb. 22).

2007 National Taiwan University (Dec. 17); International Chemical Conference, Taipei (Dec. 14-16); University of California–San Diego (Nov. 9); Johns Hopkins University (Oct. 16); University of California–Santa Barbara, (May 23); Texas A & M University (Apr. 11).

2006 University of New Mexico (Dec. 1); University of Nevada (Nov. 17); University of Michigan (Nov. 14); Michigan State University, Dean George Leroi symposium (Oct. 6); University of Rochester (Sept. 18); University of Minnesota (Mar. 2); University of Arkansas (Feb. 13); University of Nebraska (Jan. 17).

2005 "Dioxygen Activation Chemistry of Metalloenzymes and Models" symposium, International Chemical Congress of Pacific Basin Societies (Pacifichem), Honolulu, HI (Dec.); University of California–Berkeley, (Nov. 4); Columbia University (Oct. 20); Wayne State University (Sept. 22); 12th International Conference on

Biological Inorganic Chemistry (ICBIC), Ann Arbor, MI (Aug.); Western Washington University (May 6); Metal Ions in Biology Gordon Research Conference (Jan.).

2004 Purdue University (Nov. 9); University of California–Davis (Oct. 21); Inorganic Chemistry Gordon Research Conference (Jul. 18); "Metalloenzymes" symposium, Joint Regional Meeting of the Northwest and Rocky Mountain Sections of the American Chemical Society, Logan, UT (Jun. 7); "Non-heme Iron Chemistry in Biology" symposium, 227th National Meeting of the American Chemical Society, Anaheim, CA (Mar.); Stanford University (Feb. 10); California Institute of Technology (Feb. 9).

2003 Montana State University (Nov. 7); Massachusetts Institute of Technology/Harvard University (Sept. 24); Brandeis University (Sept. 23); 11th International Conference on Biological Inorganic Chemistry (ICBIC), Cairns, Australia (Jul.); University of Kansas (May 2); Michigan State University (Mar. 13).

2001 10th International Conference on Biological Inorganic Chemistry (ICBIC), Florence, Italy (Aug.); University of Wisconsin (Mar.); Metal Ions in Biology Gordon Research Conference (Jan.).

V. Publications: career total [60] in press [ ] submitted [2] book chapters, reviews [ ]

Selected publications: (*corresponding author)

1. Coggins, M. K.; *Kovacs, J. A. "Structural and Spectroscopic Characterization of Metastable Thiolate-Ligated Manganese(III)-Alkylperoxo Species," *J. Am. Chem. Soc.* **2011**, *submitted* (#ja-2011-05520u).
2. Coggins, M. K.; Brines, L. M.; Toledo, S.; Kaminsky, W.; *Kovacs, J. A. "Insight Into the Effect that Thiolate Ligands Have on Hydrogen Atom Transfer Reactions Promoted by Water Soluble Lipoxygenase Mimics," *J. Am. Chem. Soc.* **2011**, *submitted* (#ja-2011-04434x).
3. Swartz, R. D.; Coggins, M. K.; Kaminsky, W.; *Kovacs, J. A. "Nitrile Hydration by Thiolate- and Alkoxide-Ligated Co-NHase Analogues. Isolation of Co(III)-Amidate and Co(III)-Iminol Intermediates," *J. Am. Chem. Soc.* **2011**, *133*, 3954-3963.
4. Villar-Acevedo, G.; Nam, E.; Fitch, S.; Benedict, J.; Freudenthal, J.; Kaminsky, W.; *Kovacs, J. A. "Influence of Thiolate Ligands on Reductive N–O Bond Activation. Probing the O_2^- Binding Site of a Biomimetic SOR Analogue, and Examining the Proton-Dependent Reduction of Nitrite," *J. Am. Chem. Soc.* **2011**, *133*, 1419-1427 *(highlighted on "JACS Select" website as a "recent significant publication").*
5. Sun, N.; Dey, A.; Villar-Acevedo, G.; *Kovacs, J. A. *Darensbourg, M. Y.; *Hodgson, K. O.; *Hedman, B.; *Solomon, E. I. "S K-edge XAS and DFT Studies of High and Low Spin $\{FeNO\}^7$ Thiolate Complexes: Exchange Stabilization of Electron Delocalization in $\{FeNO\}^7$ and $\{FeO_2\}^8$," *Inorg. Chem.* **2011**, *50*, 427-436.
6. Nam, E.; Alokolaro, P. E.; Swartz, R. D.; Gleaves, M. C.; Pikul, J. and *Kovacs, J. A. "An Investigation of the Mechanism of Formation of a Thiolate-Ligated Fe(III)-OOH," *Inorg. Chem.* **2011,** *50*, 1592-1602.
7. Lugo-Mas,P.; Taylor, W.; Schweitzer, W.; Theisen, R. M.; Xu, L.; Shearer, J.; Swartz, R. D.; Gleaves, M. C.; DiPasquale, A.; Kaminsky, W.; and *Kovacs, J. A. "Properties of Square-Pyramidal Alkyl-Thiolate Fe(III)-Complexes, Including an Analogue of the Unmodified Form of Nitrile Hydratase," *Inorg. Chem.* **2008**, *47*, 11228-11236.
8. Brines, L. M.; Shearer, J.; Fender, J. K.; Schweitzer, D.; Shoner, S. C.; Barnhart, D.; Kaminsky, W.; Lovell, S.; *Kovacs, J. A. "Periodic Trends within a Series of Five Coordinate, Thiolate-Ligated $[M^{II}(S^{Me2}N_4(tren))]^+$ (M = Mn, Fe, Co, Ni, Cu, Zn) Complexes, Including a Rare Example of a Cu(II)-Thiolate," *Inorg. Chem.* **2007**, *46*, 9267-9277.
9. *Kovacs, J. A.; Brines, L. M. "Understanding How the Cysteinate Contributes to the Function of the Non-Heme Iron Enzyme Superoxide Reductase," *Acc. Chem. Res.* **2007**, *40*, 501-509.
10. Kitagawa, T.; Dey, A.; Lugo-Mas, P.; *Solomon, E. I.; *Kovacs, J. A. "A Functional Model for the Cysteinate-Ligated Non-Heme Iron Enzyme Superoxide Reductase (SOR)," *J. Am. Chem. Soc.* **2006**, *128*, 14448-14449.
11. Lugo-Mas, P.; Dey, A.; Xu, L.; Davin, S. D.; Benedict, J.; Kaminsky, W.; *Hodgson, K. O.; *Hedman, B.; *Solomon, E. I.; *Kovacs, J. A. "How Does Single Oxygen Atom Addition Affect the Properties of an Fe-Nitrile Hydratase Analogue? The Compensatory Role of the Unmodified Thiolate," *J. Am. Chem. Soc*. **2006**, *128*, 11211-11221.

12. Dey, A.; Chow, M.; Taniguchi, K.; Lugo-Mas, P.; Davin, S. D.; Maeda, M.; *Kovacs, J. A.; *Odaka, M.; *Hedman, B.; *Hodgson, K. O.; *Solomon, E. I. "S K-edge XAS and DFT Calculations on Nitrile Hydratase: Geometric and Electronic Structure of the Non-Heme Iron Active Site," *J. Am. Chem. Soc*. **2006**, *128,* 533-541.
13. Kennepohl, P.; Neese, F.; Schweitzer, D.; Jackson, H. L.; *Kovacs, J. A; *Solomon, E. I. "Spectroscopy of Non-Heme Iron Thiolate Complexes: Insight into the Electronic Structure of the Low-Spin Active Site of Nitrile Hydratase," *Inorg. Chem.* **2005**, *44*, 1826-1836.
14. Theisen, R. M.; *Kovacs, J. A. "The Role of Protons in Superoxide Reduction by a Superoxide Reductase Analogue," *Inorg. Chem.* **2005**, *44*, 1169-1171.
15. Theisen, R. M.; Shearer, J.; Kaminsky W.; *Kovacs, J. A. "Steric and Electronic Control Over the Reactivity of a Thiolate-Ligated Fe(II) Complex with Dioxygen and Superoxide. Reversible μ-oxo Dimer Formation," *Inorg. Chem.* **2004**, *43*, 7682-7690.
16. Kovacs*, J. A. "Synthetic Analogues of Cysteinate-Ligated Non-Heme Iron, and Non-Corrinoid Cobalt Enzymes," *Chem. Rev.* **2004**, *104*, 825-848 (*special thematic issue on Biomimetic Inorganic Chemistry*).
17. *Kovacs, J. A. "Dioxygen Activation by Non-Heme Fe-Enzymes," *Science*, **2003**, *299*, 1024-1025 (*invited "Perspective").*
18. Shearer, J.; Fitch, S. B.; Kaminsky, W.; Scarrow, R. C.; *Kovacs, J. A. "How Does Cyanide Inhibit Superoxide Reductase? Insight from Synthetic $Fe^{III}N_4S$ Model Complexes," *Proc. Natl. Acad. of Sci. U.S.A.*, **2003**, *100*, 3671-3676 (*special feature issue on Bioinorganic Chemistry*).
19. Schweitzer, D.; Shearer, J.; Rittenberg, D.; Ellison, J. J.; Shoner, S. C.; Loloee, R.; Lovell, S. C.; Barnhart, D. *Kovacs, J. A. "Enhancing Reactivity via Structural Distortion," *Inorg. Chem*. **2002**, *41,* 3128-3136.
20. Shearer, J.; Kung, I. Y.; Lovell, S.; *Kovacs, J. A. "Why is There an 'Inert' Metal Center in the Active-Site of Nitrile Hydratase? Reactivity and Ligand Dissociation From a Five Coordinate Co(III) Nitrile Hydratase Model," *J. Am. Chem. Soc*. **2001**, *123,* 463-468.
21. Shearer, J.; Kung, I. Y.; Lovell, S.; *Kovacs, J. A. "A Co(III) Complex in a Mixed Sulfur/Nitrogen Ligand Environment: Modeling the Substrate- and Product-Bound Forms of the Metalloenzyme Thiocyanate Hydrolase," *Inorg. Chem*., **2000**, *39*, 4998-4999.
22. Kung, I.; Schweitzer, D.; Shearer, J.; Taylor, W. D.; Jackson, H. L.; Lovell, S.; *Kovacs, J. A. "How Do Oxidized Thiolate Ligands Affect the Electronic and Reactivity Properties of a Nitrile Hydratase Model Compound?" *J. Am. Chem. Soc*. **2000**, *122*, 8299-8300.
23. Shoner, S. C.; Nienstedt, A.; Ellison, J. J.; Kung, I.; Barnhart, D.; *Kovacs, J. A. "Structural Comparison of Thiolate-Ligated M^{II}=Fe^{II}, Co^{II}, Ni^{II}, and Zn^{II} Ions Wrapped in a Chiral Helical Ligand," *Inorg. Chem*., **1998**, *37*, 5721-5726.
24. *Scarrow, R. C.; Strickler, B.; Ellison, J. J.; Shoner, S. C.; *Kovacs, J. A.; Cummings, J. G. *Nelson, M. J., "X-ray Spectroscopy of Nitric Oxide Binding to Iron in Inactive Nitrile Hydratase and a Synthetic Model Compound," *J. Am. Chem. Soc.* **1998**, *120*, 9237-9245.
25. Schweitzer, D.; Ellison, J. J.; Shoner, S. C.; Lovell, S.; and *Kovacs, J. A. "A Synthetic Model for the NO-Inactivated Form of Nitrile Hydratase," *J. Am. Chem. Soc.* **1998**, 120, 10996-10997.
26. Ellison, J. J; Nienstedt, A.; Shoner, S. C.; Barnhart, D.; Cowen, J. A.; *Kovacs, J. A. "Reactivity of Five-Coordinate Models for the Thiolate-Ligated Fe Site of Nitrile Hydratase," *J. Am. Chem. Soc* **1998**, *120*, 5691-5700.
27. Shoner, S.; Humphreys, K. J.; Barnhart, D.; *Kovacs, J.A. "A Model for the Interaction of Alcohol with the Zinc Thiolate Site of Alcohol Dehydrogenase," *Inorg. Chem*. **1995**, *34*, 5933-5934.
28. *Kovacs, J. A.; Shoner, S. C.; Ellison, J. J. "Metal-Carbon Bonds in Nature," *Science* **1995**, *270*, 587-588.

VI. Grant Activity:

Present

UW Bridge Funds (PI)	1/4/11-TBD	$100,000

(UW Provost's Office; 100% matching from Arts & Sciences Dean's Office and the Department of Chemistry)

Pending

NIH (# RO1 GM45881-19; *proposal ranked 9th percentile)* (PI)	8/1/11-7/31/15	$995,419/4 years

Past

NIH NIGMS ARRA SIRM Supp (#FA49971/A54569) (PI)	4/15/10-3/31/11	$137,980/1 year
NIH (# RO1 GM45881-18) (PI) *Structure's Influence on Reactivity in Metalloenzymes*	4/1/06-3/31/10	$1,297,875/4 years
NIH (#31K FA39208/supplement to RO1 GM45881-18) (PI) *Structure's Influence on Reactivity in Metalloenzymes*	4/1/09-3/31/10	$31,089/1 year
NSF (CHE-0840520) *Purchase of an X-ray Diffractometer* (Co-PI with Mayer and Heinekey)	11/09	$290,000/1 year
NIH (# RO1 GM45881-16-S1) (PI) *Supplement to Purchase Vac Atmospheres Dry Box*	8/9/07	$23,230/1 year
NIH Shared Instrumentation Grant (# S10 RR023656-01) *A High Field Mossbauer Instrument* (Co-PI; PI Steve Cramer, UC Davis)	5/1/08-4/30/09	$273,281/1 year
NIH High End Instrumentation Grant Program (#S10 RR023065-01) *Electron Paramagnetic Resonance (EPR)/Q-Band ENDOR Spectrometer* (Co-PI; PI: Robinson)	4/1/07-8/31/08	$1,040,735/1 year
NIH (# RO1 GM45881-15–S2)	4/1/06-3/31/07	$51,221/1 yr (direct)
NIH (# F31 GM73583-02)	10/1/04-3/31/06	$63,666/2 yrs (direct)
NIH (# RO1 GM45881-14–S2)	4/1/04-3/31/06	$102,442/2 yrs (direct)
NIH (# RO1 GM45881-14–S1)	10/1/03-3/31/04	$20,813/2 yrs (direct)
NIH (# RO1 GM45881-14)	4/1/02-3/31/06	$1,183,037/4 years
NIH (# RO1 GM45881-11)	4/1/98-3/31/02	$921,472/4 years
Environmental Protection Agency	1/1/01-6/30/02	$17,000 (direct)
NIH (#RO1 GM45881-05)	6/95-6/98	$447,044/3 years
NIH (#RO1 GM45881-01)	2/92-2/95	$305,799/3 years

VII. Honors and Awards:

Saunders Endowed Lecturer, Texas Christian University, Fort Worth, TX (Sept 15-16, 2011)
Plenary speaker, 15th International Conference on Biological Inorganic Chemistry (ICBIC), Vancouver, BC (Aug. 7-12, 2011);
Manuscript (*J. Am. Chem. Soc.* 2011, 133, 1419-1427) highlighted on "JACS Select" website as a "recent significant contribution"
Editorial Board, *BioInorganic Reaction Mechanisms* (2010-present)
Editorial Advisory Board, *Inorganic Chemistry* (1/1/09-12/31/12)
Elected Council member, Society for Biological Inorganic Chemistry (7/08-7/12)
Chair, "Metals in Biology" Gordon Research Conference (2008)
Chair, Bioinorganic subdivision of the ACS Division of Inorganic Chemistry (2007)
Vice-Chair, "Metals in Biology" Gordon Research Conference (2007)
Ad Hoc Member, NIH Macromolecular Structure and Function (MSF-A) Study Section (February 2005)
Organizer and Chair, "Non-heme Iron Chemistry in Biology" symposium, 227th ACS National Meeting, Anaheim (March 2004)
Editorial Advisory Board, *Journal of Biological Inorganic Chemistry* (1/1/04-12/31/07)
Organizer, inaugural Ronald Breslow Award Symposium, 225th ACS National Meeting, New Orleans (March 2003)
Elected Councilor, American Chemical Society Division of Inorganic Chemistry (2002-04)
Member, Board of "Expert Analysts" for *ChemTracts–Inorganic Chemistry* (1998-01)
Member, NIH Metallobiochemistry (BMT) Study Section (10/96-9/99)
Editorial Advisory Board, *Inorganic Chemistry* (1/1/97-9/99)

VIII. Additional Comments on Research, Teaching, and Service:

Summary of Selected Professional Activities

Name: James M. Mayer Date of Revised Vitae: June 10, 2011
Rank: Professor Date of Ph.D.: 1982 Date of UW hire: 1984 Date of last promotion: 1992

I. Courses Taught (number of times since 2001):

Chemistry 155 (1), 2nd Quarter honors freshman chemistry
Chemistry 165 (4), 3rd Quarter honors freshman chem. (Organic, transition metal., solid state/materials chem)
Chemistry 312 (4), Intro to the Periodic Table (junior-level; J. Mayer developed and first taught this in 1990)
Chemistry 317 (6), Advanced Inorganic Laboratory (two grad. students and J. Mayer developed this in 1990/91)
Chemistry 416 (9), Transition metal chemistry
Chemistry 496 (1), Research seminar for undergraduates
Chemistry 510 (1), Special topics in inorganic chemistry
Chemistry 591 (3), Inorganic seminar

II. Department and University Service (2001-present):

Department Committees:

Chair, Academic Personnel (1994-present); Chair's Advisory (1996-present);

College and University Committees:

Bagley Lab Renovation (2003-present); Master of Ceremonies, Chemistry Graduation Celebration (1997-present); Safety (2004-present); Upper level labs; Advisory Committee ORCA Energy Meeting (2010).

>100 Other Graduate Supervisory Committees: (does not include students in own group)

III. Research Group (as of June 10, 2011):

8	graduate students	6.5	Postdoctoral associates	27	Ph.D.s granted (career)
5	undergraduate students	0	other		

IV. Invited Lectures (career total ~250)

2001 Gonzaga University; University of Nebraska; Inorganic Reaction Mechanisms Gordon Conf.; Eastman Chemical Co., Kingsport, TN; California Institute of Technology; University of California, Los Angeles (UCLA); University of California, Irvine (UCI); BP Chemical Co., Naperville, IL; E.L. King Lecturer for the Summer Series of five lectures at the Univ. of Colorado, Boulder; Free Radical Reactions Gordon Conference; Distinguished Summer Lecturer in Inorganic Chemistry at Northwestern University (three lectures); ACS National Meeting, Chicago, IL, in symposia: "The Chemistry of the Metal-Nitrogen Bond" and "Homogeneous Catalysis in the Petroleum and Petrochemical Industry"; Joint International Meeting of The Electrochemical Society and the International Society of Electrochemistry, San Francisco CA, in symposium "Mechanistic Organic and Organometallic Electrochemistry."

2002 Western Washington University; Metals in Biology Gordon Conference; Columbia University; SUNY, Stony Brook; Arizona State University; University of Arizona; ACS National Meeting, Orlando, FL, in symposium "Activation and Functionalization of Hydrocarbons"; Dow Chemical Company, South Charleston, WV; University of California, Davis; University of California, San Diego.

2003 Washington University, St. Louis, MO; University of Kansas, Lawrence; ACS National Meeting, New Orleans, LA, Award Symposium for Rich Eisenberg and Bill Jones; ACS National Meeting, New Orleans, Scorpionate Ligand Symposium; University of Michigan, Ann Arbor; Photosynthesis Gordon Conference; Radicals in the Rockies Conference, Telluride, CO; Reilly Lecturer at Notre Dame University (3 lectures),; Invited Speaker, Taiwan Bioinorganic Symposium honoring Sunney Chan, Teipei, Taiwan.

2004 Inorganic Reaction Mechanisms Meeting (Royal Society of Chemistry), Athens, Greece; Johns Hopkins University, Baltimore, MD; University of Delaware, Newark, DE; 227th ACS National Meeting, Anaheim, CA, in symposium "Non-heme Iron Chemistry in Biology"; Invited speaker at the Murphry Award Symposium in honor of James E. Lyons; 227th ACS National Meeting, Anaheim, CA, in symposium "Advances in the Catalysis of the Selective Oxidation of Hydrocarbons," Industrial and Engineering Chemistry Division; Inorganic Chemistry Gordon Conference, Newport, RI; Invited speaker, Gordon Conference on Donor/Acceptor Interactions, Newport, RI.

2005 University of Pennsylvania, Philadelphia, PA; Columbia University, New York, NY; Yale University, New Haven, CT; Massachusetts Institute of Technology, Cambridge, MA; Tufts University, Boston, MA; Brandeis University, Waltham, MA; Oak Ridge National Laboratory, Oak Ridge, TN; University of Tennessee, Knoxville, TN; Michigan State University, East Lansing, MI; Dow Chemical Co., Midland, MI; Gordon Conference on Organometallic Chemistry, July; Advances in Homogeneous Oxygen Chemistry (ADHOC-05), Köln, Germany, July.

2006 **"**Organometallic complexes: the road from gas to solution phase energetics" workshop, Mesilla, NM; University of North Texas, Denton, TX; Tulane University, New Orleans LA; Portland State University, Portland, OR; University of California, Irvine; Department of Energy/Basic Energy Sciences Catalysis Contractors meeting, CA; 20th International Symposium on Radical Ion Reactivity (ISRIR 2006), Monteporzio, Italy; Symyx, Inc., Santa Clara, CA; 232rd ACS National Meeting, San Francisco, CA, in symposium "Radical Metal Complex Chemistry."

2007 Gerhard Closs lectureship, University of Chicago, Chicago, IL; Inorganic Reaction Mechanisms Gordon Conference; University of Toronto, Toronto ON, Canada; California Institute of Technology, Pasadena, CA; Eidgenössische Technische Hochschule Zürich (ETH), Switzerland; University of Basel, Switzerland; University of Geneva, Switzerland; University of Fribourg, Switzerland; Ecole Polytechnique Federale de Lausanne (EPFL), Switzerland; Dow Chemical Co., Freeport, TX; Keynote Speaker, Molybdenum and Tungsten Enzymes Gordon Research Conference; Bowling Green State Univ., Bowling Green OH.

2008 Plenary Lecturer, European Inorganic Reaction Mechanisms Conference, Barcelona, Spain; Peking University, Beijing, China; City University of Hong Kong; University of Hong Kong; Reed College, Portland, OR; Vanderbilt University, Nashville, TN; The Ohio State University, Columbus OH; University of Wisconsin, Madison, WI; Boston University, Boston, MA; Dartmouth College, Hanover, NH; University of Massachusetts, Amherst, MA; International Conference on Coordination Chemistry (ICCC), Jerusalem; University of California, Berkeley; Wayne State University, Detroit, MI; University of Michigan, Ann Arbor, MI; College of William and Mary, Williamsburg VA; ExxonMobil, Clinton, NY.

2009 University of California, Los Angeles (UCLA); 237th ACS National Meeting, Salt Lake City, UT, Award Symposium in Honor of Kenneth D. Karlin; 14th International Conference on Biological Inorganic Chemistry (ICBIC14), Nagoya, Japan; Okayama University, Japan; Nara Institute of Science and Technology, Nara, Japan; Osaka University, Suita Campus, Osaka Japan; Princeton University, Princeton, NJ; Symposium on Creation of Functional Materials 2009, Tsukuba University.

2010 Ewha Womans University, Seoul, Korea; Uppsala University, Uppsala, Sweden; University of Stockholm, Stockholm, Sweden; Emory University, Atlanta, GA; Georgia Tech, Atlanta, GA; University of California, Irvine (UCI); Cabot Corporation, Billerica, MA; University of Oregon, Eugene, OR; Environmental Molecular Sciences Laboratory, Richland, WA; Invited Lecturer, Japan Society of Coordination Chemistry, Osaka, Japan; Debye Lectures, Cornell University (2 lectures); Argonne National Laboratory, Argonne, IL; Nakamoto Distinguished Lecture in Chemistry, Marquette University, Milwaukee, WI; Pacifichem 2010, Honolulu, HI, in symposia "Discrete Coordination Systems with Switchable Structures and Properties" and "Dioxygen Activation Chemistry and Catalytic Oxidation Reactions.".

2011 Harvey Mudd College, Claremont, CA; California Institute of Technology, Pasadena, CA; Harvard-MIT Joint Inorganic Seminar, Cambridge, MA; Plenary Lecturer, 17th National Congress of Physical and Inorganic Chemistry, Cordoba, Argentina; Sandia National Laboratory, Albuquerque, NM; Los Alamos National Laboratory, Los Alamos, NM; 242nd ACS National Meeting, Denver, CO, in "Inorganic Chemistry 50th Anniversary Symposium"; PCET 2011 'From biology to catalysis', Loire Valley, France, Oct. 9-13; Zing Conference on Coordination Chemistry, Riviera Maya, México.

V. Publications (2001 - present): *72* in press 0 submitted 2 book chapters, reviews 6

2001: 6 pubs: 4 JACS, 1 Science, 1 Inorg. Chem., 2002: 3 pubs: 2 JACS, 1 Inorg. Chem.
2002: 4 pubs: 3 JACS, 1 Inorg. Chem.
2003: 6 pubs: 4 JACS, 2 Inorg. Chem.
2004: 8 pubs: 2 JACS, 2 IC, 3 reviews (Ann. Rev. Phys. Chem.; Biochim. Biophys. Acta)
2005: 6 pubs: 3 JACS, 1 Angew. Chem. 2 Inorg. Chem.
2006: 7 pubs: Photosynth. Res, Organometallics, J. Chem. Theory & Comput., Inorg. Chim. Acta, JACS, J Mol Catal. A, Angew. Chem.
2007: 4 pubs: 1 JACS, 2 Inorg. Chem., 1 Organometallics.
2008: 10 pubs: 5 JACS, 2 Chem. Comm., Organometallics, Proc. Natl. Acad. Sci., Angew. Chem.
2009: 9 pubs: 6 JACS, 1 Inorg. Chim. Acta, 1 Inorg. Chem., 1 Dalton Trans.
2010: 7 pubs: 3 JACS, 1 Proc. Natl. Acad. Sci., 2 Inorg. Chem., 1 Chem. Rev.

136. "Facile Concerted Proton-Electron Transfers in a Ruthenium Terpyridine-4′-Carboxylate Complex with a Long Distance Between the Redox and Basic Sites" V. W. Manner, A. G. DiPasquale, J. M. Mayer *J. Am. Chem. Soc.* **2008**, *130*, 7210-7211.

137. "Surprisingly Long-Lived Ascorbyl Radicals in Acetonitrile: Concerted Proton-Electron Transfer Reactions and Thermochemistry" J. J Warren, J. M. Mayer *J. Am. Chem. Soc.* **2008**, *130*, 7546-7547.

138. “Reactions of Iridium Hydride Pincer Complexes with Dioxygen: New Dioxygen Complexes and Reversible O_2 Binding” Williams; D. B.; Kaminsky W.; Mayer J. M.; Goldberg K. I. *Chem. Commun*. **2008**, 4195-4197.
139. “Hydrogen Atom Transfer Reactions of a Ruthenium Imidazole Complex: Hydrogen Tunneling and the Applicability of the Marcus Cross Relation” A. Wu, J. M. Mayer, *J. Am. Chem. Soc.* **2008**, *130*, 14745-14754.
140. “Autoxidation of Platinum(IV) Hydrocarbyl Hydride Complexes to Form Platinum(IV) Hydrocarbyl Hydroperoxide Complexes” J. L. Look, D. D. Wick, J. M. Mayer, K. I. Goldberg, *Inorg. Chem*. **2009**, *48*, 1356-1369.
141. “Synthesis and Oxidation of Cp^*Ir^{III} Compounds: Functionalization of a Cp* Methyl Group” L. S. Park-Gehrke, J. Freudenthal, W. Kaminsky, A. G. DiPasquale, J. M. Mayer, *Dalton Trans*. **2009**, 1972-1983.
142. “Trends in Ground-State Entropies for Transition Metal Based Hydrogen Atom Transfer Reactions” E. A. Mader, V. W. Manner, T. F. Markle, A. Wu, J. A. Franz, J. M. Mayer, *J. Am. Chem. Soc.* **2009**, *131*, 4335-4345.
143. “Slow Hydrogen Transfer Reactions of Oxo- and Hydroxo-Vanadium Compounds: the Importance of Intrinsic Barriers” C. R. Waidmann, X. Zhou, E. A. Tsai, W. Kaminsky, D. A. Hrovat, W. T. Borden, J. M. Mayer *J. Am. Chem. Soc*. **2009**, *131*, 4729-3.
144. “Dihydroxylation of Alkenes Using a Tp-Osmium Complex” A. Dehestani, A. Wu, R. Hayoun, W. Kaminsky, J. M. Mayer, *Inorg. Chim. Acta*, **2009**, *362*, 4534–4538.
145. “Concerted Proton-Electron Transfer in a Ruthenium Terpyridyl-Benzoate System with a Large Separation between the Redox and Basic Sites” V. W. Manner, J. M. Mayer, *J. Am. Chem. Soc.* **2009**, *131*, 9874–9875.
146. “Proton-Coupled Electron Transfer of Ruthenium(III)-Pterin Complexes: A Mechanistic Insight” S. Miyazaki, T. Kojima, J. M. Mayer, S. Fukuzumi, *J. Am. Chem. Soc.* **2009**, *131*, 11615–11624.
147. “Nitroxyl Radical plus Hydroxylamine Pseudo Self-Exchange Reactions: Tunneling in Hydrogen Atom Transfer” A. Wu, E. A. Mader, A. Datta, D. A. Hrovat, W. T. Borden, J. M. Mayer, *J. Am. Chem. Soc.* **2009**, *131*, 11985–11997.
148. “Oxidatively Induced Reductive Elimination from ($^tBu_2$bpy)Pd($Me)_2$: Palladium(IV) Intermediates in a One-Electron Oxidation Reaction” M. Lanci, M. Remy, W. Kaminsky, J. M. Mayer,* M. Sanford,* *J. Am. Chem. Soc.* **2009**, *131*, 15618–15620.
149. “Synthesis and Reactivity of Oxo-Peroxo-Vanadium(V) Bipyridine Compounds” C. R. Waidmann, A. DiPasquale, J. M. Mayer, *Inorg. Chem.*, **2010**, *49*, 2383–2391.
150. “Probing 'Spin-Forbidden' Oxygen Atom Transfer: Gas-Phase Reactions of Chromium-Porphyrin Complexes” M. Crestoni,* S. Fornarini,* F. Lanucara, J. Warren, J. Mayer,* *J. Am. Chem. Soc.* **2010**, *132*, 4336–4343.
151. “Predicting Organic Hydrogen Atom Transfer Rate Constants Using the Marcus Cross Relation” J. J. Warren, J. M. Mayer, *Proc. Nat. Acad. Sci.* **2010**, *107*, 5282–5287.
152. “Platinum-Catalyzed Intramolecular Hydrohydrazination: Evidence for Alkene Insertion into a Pt-N Bond” J. M. Hoover, A. DiPasquale, J. M. Mayer,* F. E. Michael,* *J. Am. Chem. Soc.* **2010**, *132*, 5043-5053.
153. “The Importance of Precursor and Successor Complex Formation in a Bimolecular Concerted Proton-Electron Transfer Reaction” E. A. Mader, J. M. Mayer, *Inorg. Chem.* **2010**, *49*, 3685-3687.
154. “The thermochemical and kinetic properties of ascorbate are tuned by its local environment: Solution chemistry and biochemical implications” J. J. Warren, J. M. Mayer, *J. Am. Chem. Soc.* **2010**, *132*, 7784-7793.
155. “The Thermochemistry of Proton-Coupled Electron Transfer Reagents and its Mechanistic Implications” J. J. Warren, T. A. Tronic, J. M. Mayer, *Chem. Rev.* **2010**, *110*, 6961-7001.
156. “Understanding Hydrogen Atom Transfer: from Bond Strengths to Marcus Theory” J. M. Mayer, *Acc. Chem. Res.* **2011**, *44*, 36–46.
157. “Metal-free Carbon Dioxide Reduction and Acidic C-H Activations using a Frustrated Lewis Pair” S. D. Tran, T. A. Tronic, W. Kaminsky, D. M. Heinekey, J. M. Mayer *Inorg. Chim. Acta*, **2011**, *369*, 126-132.
158. “Electron Transfer Between Colloidal ZnO Nanocrystals” R. Hayoun, K. M. Whitaker, D. R. Gamelin, J. M. Mayer, J. Am. Chem. Soc., **2011**, *133*, 4228-4231.
159. “A Simple Marcus-Theory Type Model for Hydrogen Atom Transfer/Proton-Coupled Electron Transfer” J. M. Mayer, *J. Phys. Chem. Lett.* **2011**, *2*, 1481–1489.
160. “Proton-Coupled Electron Transfer Reactions at a Heme-Propionate in an Iron-Protoporphyrin-IX Model Compound” J. J. Warren, J. M. Mayer, *J. Am. Chem. Soc.* **2011**, *133*, 8544–8551.

VI. Grant Activity: **Current Support** (direct + indirect costs unless otherwise indicated)

NIH 9/1/2008-8/31/2012 $1,263,340 (total direct costs over 4 years)
Understanding Coupled Transfers of Electrons and Protons Relevant to Biological Chemistry

NSF 8/1/2007-7/31/2012 $15M for 17 PIs (total amount over 5 years)
Center for Enabling New Technologies through Catalysis (CENTC) $138,018 (Mayer FY2010-11)

DOE 9/1/2009-8/31/2014 $23M (total anticipated amount)
Center for Molecular Electrocatalysis Energy Frontier Research Centers (EFRC) $250,000 (Mayer FY2010-11)

E.I. DuPont de Nemours & Co 7/26/95-(no end date) $30,000 (total, no overhead)
DuPont Aid to Education

NIH 9/1/2009-8/31/2011 $187,302 (total amount over 2 years)
Understanding Coupled Transfers of Electrons and Protons Relevant to Biological Chemistry (supplement)

ACS Petroleum Research Fund (PRF) 9/1/2011-8/31/2011 $100,000 (total direct costs over 2 years)
The Role of Protons in Charge Transfer Reactions of Metal Oxide/Solution Interfaces

Current Awards to Mayer Group members

NIH 7/16/2010-7/15/2011 $45,590 (w/ non-competitive renewals for 2 years)
Ruth L. Kirschstein National Research Service Award (Postdoctoral Fellowship) (Alexander R. Fox)
Separated Concerted Proton-Electron Transfer with Biomimetic Models of Peroxidase Compound I and Compound II

NSERC 07/2011-07/2013 CND$80,000
Postdoctoral Fellowship (Johanna Blacquiere)

UW Student Technology Fee Award $99,555.41
Purchase of an Inductively-Coupled Plasma Atomic Emission Spectrometer (ICP-AES) (Dept. of Chemistry)
(Proposal written by Mayer graduate students Rebecca Hayoun, Miles Braten, and Carolyn N. Valdez)

VII. Honors and Awards (2001-present):

Chair, Gordon Conference on Inorganic Reaction Mechanisms for 2003.
Associate Editor, *Inorganic Chemistry*, January 2001-present.
E.L. King Lecturer at the University of Colorado Boulder, five lectures, July 9-13, 2001
Distinguished Summer Lecturer in Inorganic Chemistry, Northwestern University, (3 lectures) August 14-16, 2001.
Reilly Lecturer at Notre Dame University, three lectures, September 16-18, 2003.
First recipient of the Paul Hopkins Faculty Award, University of Washington Department of Chemistry, May 2004.
Gerhard Closs Lecturer, University of Chicago, January 2007.
Keynote Speaker, Molybdenum and Tungsten Enzymes Gordon Research Conference, July 2007.
Plenary Lecturer, European Inorganic Reaction Mechanisms Conference, Barcelona, Spain, January 2008.
Debye Lecturer, Cornell University, October 2010.
Nakamoto Distinguished Lecturer, Marquette University, October 2010.
Plenary Lecturer, 17th National Congress of Physical and Inorganic Chemistry, Cordoba, Argentina, May 3-8, 2011.

IX. Personal Statement:

I have had the pleasure of working with about a hundred graduate students, undergraduates, and postdoctoral fellows in my laboratory at UW, and the pleasure of teaching many more students in the classroom. Our research efforts have focused on discovering and understanding new chemical reactions, particularly redox reactions that involve the making and breaking of chemical bonds. This journey has taken us all over the periodic table, and from organometallic and coordination chemistry to bioinorganic chemistry, physical organic chemistry, physical chemistry, and materials chemistry. Our primary efforts for some time have been on proton-coupled electron transfer (PCET), particularly reactions that involve transfer of one electron and one proton such as hydrogen atom transfers. These are key to processes from enzyme mechanisms to electrocatalysis of energy-important reactions such as the oxidation of water to dioxygen. We have developed an understanding of hydrogen atom transfer reactions based on their driving force (bond dissociation free energies) and intrinsic barriers, in a Marcus Theory-inspired model. We are delighted that this approach has been of value to other researchers, especially in the understanding of metalloenzymes and in the development of new stoichiometric and catalytic reactions. We are excited to have started, in the last 2-3 years, a number of new research directions inspired by our understanding of PCET and related redox processes. We will soon submit our first paper on the first copper electrocatalyst for water oxidation, an earth-abundant catalyst that self-assembles from inexpensive components. In a related project, we are developing new electrocatalysts for dioxygen reduction that utilize proton relays in the second coordination sphere. We are also very excited to have started–and just this week received a PRF New Directions grant for a collaborative project with Prof. Daniel Gamelin on redox reactions of soluble oxide nanoparticles.

Summary of Activities in the Last Five Years

Name: **Pradipsinh K. Rathod** Date of Revised Vitae: June 21, 2010
Rank: Professor Date of Ph.D.: 1981 Date of UW hire: 2001 Last promotion: 2001

I. Courses Taught (all, number of times):

Chemistry: Chem 110: Introduction to Chem. (3 hrs; Fall 2002-10); Chem 543: Chemical Biology (3 hrs; Spr 2001-03, Spr 2005, 2006); Chem 239: Organic Chem (3 hrs; Spr 2004, Spr 2007-10); Graduate organic seminars, Graduate organic problems, Graduate careers seminars.
Other at UW: Antibiotic Resistance mechanisms, Marilyn C. Roberts, **Pabio 540;** Drug discovery, Wesley C. Van Voorhis, **Pabio 590C;** Protein structure-based design of drugs and vaccines, Wim Hol, **BSTR 520,** Career in Science Panel, **Pabio 553**

II. Department and University Service (2005 - present):

Department Committees: Faculty search; Lab safety; Facilities; Space; Organic Seminar; Careers Seminar;
College and University Committees: University Faculty Senate 2007-2009, University Post-Doc committee
~25 Other Graduate Supervisory Committees: (does not include students in my own group)

III. Research Group (current)

3	graduate students	**9**	postdoctorals	9	Ph.D.'s granted
5	undergraduate students	**1**	Res. Assist/ Joint students		

IV. Invited Lectures (2005 -10) **36**

2005:
HHMI-BWF career workshop, panelist, Bethesda, MD (6/9)
Malaria Gordon Conf., Drug session chair, Oxford, UK (8/21)
SBRI seminar, Seattle, WA (11/21)
ASTMH meeting, Invited speaker, Washington, DC (12/12)
TCGA seminar, New Delhi, India (12/17)
Int'l Ctr for Genetic Engr. & Biotech., sem., New Delhi, (12/19)

2006:
Keystone meeting, Malaria, invited speaker, Taos, NM (3/4)
Drugs for Third World meeting, speaker, Trieste, Italy (6/9)
Biology of Parasitism, instructor, Woods Hole, MA (7/28)
BWF-SigmaXi careers, speaker, Woods Hole, MA (9/15)
Boise State University, Chemistry Seminar, Boise, ID (10/13)

2007:
Biology of Parasitism course, instructor, Woods Hole, MA (7/14)
Molecular Parasitology Mtg, co-Dir., Woods Hole, MA (9/14)
Medicines for Malaria Meeting, co-presenter, Geneva (11/07)

2008:
Bay Area Parasitology Meeting, San Francisco, CA (3/3)
ACS regional mtg, Bioorganic Symp. Speaker, Provo, UT (6/17)
Molecular Parasitology mtg, co-director, Woods Hole, MA (9/21)
Medicines for Malaria Meeting, co-presenter, Boston (6/30)
U. Minnesota, Center for Drug Design sem., Minneapolis (10/15)

2009:
Cornell Univ., Organic Chemistry seminar
Keystone mtg, Drugs for Protozoan Parasites, Breckenridge (3/23)
Kasturba Hosp. for Infect. Dis., inv. sem., Mumbai, India (6/28)
Maharaja Sayajirao U., inv. seminar, Vadodara, India (6/30)
Medicines for Malaria Meeting, DHODH project co-presenter, PYP1 project presenter, Singapore (7/15)
TCGA seminar, New Delhi, India (7/06)
Malaria Gordon Conf., Gene exp. sess. chair, Oxford UK (9/10)
Molecular Parasitology Mtg, co-Dir., Woods Hole, MA (9/13)

2010:
NIH US-Japan Parasitogy, inv. speaker, San Diego, CA (1/10)
MMV DHODH trilateral meeting, Geneva, Switzerland (1/18)
Jawaharlal Nehru U., Life Sci. Lec, New Delhi, India (4/12)
Seattle Malaria Group, SBRI, Seattle, (6/9)
Sphaera Pharma, NIH ICEMR mtg chair, Manesar, India (7/8)
Medicines for Malaria ESAC Mtg, DHODH project co-presenter, Madrid (7/15), Malaria Workshop, Madrid (7/16)
NIAID Clin Res Management, Bangkok, Thailand (09/20)
GCE presentations, B&M Gates Foundation, Seattle (10/25)
NIH, ICEMR Kickoff Meeting, Bethesda, MD (10/27)
NYU School of Medicine, New York (11/TBA)

V. Publications (2006-10): 19 in press | 4 submitted | 3 book chapters, reviews |

1. Mudeppa, D.G., et al. **2007 "**Cell-free production of functional Plasmodium falciparum dihydrofolate reductase-thymidylate synthase" Mol. Biochem. Parasitol. 151, 216-9.
2. Eastman, R.T., et al. **2007**. "Resistance mutations at the lipid substrate binding site of Plasmodium falciparum protein farnesyltransferase" Mol. Biochem. Parasitol., 152, 66-71.
3. Antia, M., Herricks, T., Rathod, P.K. **2007** "Microfluidic modeling of cell-cell interactions in malaria pathogenesis", PloS Pathogens, 3:e99.
4. Malmquist, N., Gujjar, R., Rathod, P.K., and Phillips, M. **2008** "Analysis of Flavin Oxidation and Electron Transfer Inhibition in *Plasmodium falciparum* Dihydroorotate Dehydrogenase", Biochemistry, 47:2466-2475. PMID18225919
5. Mui, E.J., et al. **2008** "Novel triazine JPC-2067-B inhibits *Toxoplasma gondii in vitro* and *in vivo*" PLoS Negl Trop Dis, 2:e190. PMC2254147
6. Hunter, J.H., Gujjar, R., Pang, C.K.T., and Rathod, P.K. **2008**. "Kinetics and Ligand-Binding Preferences of *Mycobacterium tuberculosis* Thymidylate Synthases, ThyA and ThyX". PLoS One 3(5): e2237. PMC2386288

7. Cui, L., Miaoet al. **2008**. "The Histone Acetyltransferase Inhibitor Anacardic Acid Leads to Changes in Global Gene Expression During in vitro Plasmodium falciparum Development", Eukaryot Cell. 2008 May 16. PMC2446667
8. Phillips, M.A., et al. **2008**. "Triazolopyrimidine-based dihydroorotate dehydrogenase inhibitors with potent and selective activity against the malaria parasite, *Plasmodium falciparum", J. Med. Chem.* 51, 3649-53. PMC2624570
9. Antia, M., Herricks, T., and Rathod, P.K. **2008** "Microfluidic models for Malaria Pathogenesis (Invited Review)", Cell. Microbiol., 10(10):1968-74. PMID18754851
10. Gonzales, J.M., et al **2008** "Regulatory Hotspots in the Malaria Parasite Genome Dictate Transcriptional Variation." PLoS Biol 6(9):e238 PMC2581438
11. Ganessan, K., et al. **2008** "A Genetically Hard-wired Metabolic Transcriptome in *Plasmodium falciparum* Fails to Mount Protective Responses to Lethal Antifolates", PLoS Pathogens, 4(11): e1000214. PMC2581438
12. Gujjar, R., et al **2009**. "Identification of a metabolically stable triazolopyrimidine-based dihydroorotate dehydrogenase inhibitor with anti-malarial activity in mice", J Med Chem. 52(7):1864-72.PMID: 19296651
13. Herricks T, Antia M, Rathod PK**. 2009**. "Deformability limits of Plasmodium falciparum-infected red blood cells". Cell Microbiol. 11(9):1340-53. PMID: 19438513
14. Pang CK, et al **2009** "Catalytic and ligand-binding characteristics of Plasmodium falciparum serine hydroxymethyltransferase". Mol Biochem Parasitol. 168(1):74-83. PMID: 19591883
15. Deng X, et al. **2010** "Structural plasticity of malaria dihydroorotate dehydrogenase allows selective binding of diverse chemical scaffolds". J Biol Chem. 284(39):26999-7009. PMID: 19640844
16. Larson ET, et al **2010** "The crystal structure and activity of a putative trypanosomal nucleoside phosphorylase reveal it to be a homodimeric uridine phosphorylase", J Mol Biol. 396(5):1244-59. PMID: 20070944
17. Sun XE, et al. **2010** "Prodrug activation by Cryptosporidium thymidine kinase", J Biol Chem. 285(21):15916-22. PMID: 20231284.
18. Phillips MA, Rathod PK. **2010** "Plasmodium dihydroorotate dehydrogenase: a promising target for novel anti-malarial chemotherapy". Infect Disord Drug Targets. 10(3):226-39.PMID: 20334617
19. Guiguemde WA, et al (34 authors) **2010**. "Chemical genetics of Plasmodium falciparum". Nature 465(7296), 311-5.PMID: 20485428

VI. Grant Activity (2005 - present):

Current		
Lead optimization of a DHODH Inhibitor (MMV/NIH UO1)		
Co-PIs: Phillips (Texas), Rathod (UW), Charman (Monash)	2007–12	UW: $2,570,285
Suppression of hypermutagenesis in malaria (Phase II, Grand Challenges Explorations (Gates))		
PI: Rathod (UW)	2009–11	$1,000,000
Microfluidics for malaria pathogenesis in Africa (NIH R21, PI: Rathod)	2009–11	$365,456
Pyrimidinyl prodrugs (PYPs) for malaria chemotherapy (NIHR56, PI: Rathod)	2009–10	$794,004
Malaria evolution in South Asia (NIH ICEMR U19, PI: Rathod)	2010-17	$14,299,192
Pending		
HT assays for malarial topoisomerases (NIH R01, PI: Rathod)	2010-13	$ 1,089,354

VII. Honors and Awards (2005 - present):

"Genomes to Drugs"; 2002-08 Reviewer, 5 different NIH study sections; 2002-06 Senior Scholar Award, Ellison Medical Foundation; 2005 Co-Chair, Keystone Meeting, Parasite Chemotherapy; 2006-09 Co-Chair, Molecular Parasitology Meeting, Woods Hole, MA; 2006-present, Editorial Board, Molecular and Biochemical Parasitology; 2009 Grand Challenge Explorations (Phase I & II), Bill and Melinda Gates Foundation; 2010 NIH International Centers for Malaria Research award.

VIII. Additional Comments on Research, Teaching, and Service:

***UW activities**:*

I served for two years on the UW faculty senate.
Awarded 9 PhDs (Farajalla, Herricks, Bowman, Pang, Hunter, Herricks, Freeman, White).
Alumni got good job offers: Antia (Program Officer, Wellcome Trust), Hunter (Senior scientist, Seattle Genetics), Bowman (Senior scientist, IDRI), Gujjar (Senior scientist, Organix), Freeman (Analyst, Intellectual Ventures). Two junior lab students joined outstanding graduate programs: Mark Stevens (MIT), Michelle Kriner (Yale).

***Global Health**:*

2008: Received a Grand Challenge Explorations (Phase 1) Award from the Bill and Melinda Gates Foundation.
2009: First in the GCE program to convert a Phase I project to a Phase II Award.
2010: Receive an NIH 7-year grant for about $14 million to study Evolution of malaria in India.

Summary of Selected Professional Activities

Name: Philip J. Reid — Date of Revised Vitae: 06/06/11
Rank: Professor — Year of PhD: 1992 — Year of UW hire: 1995 — Year of last promotion: 2004

I. Courses Taught (name, times taught since last 10-year review):

Chem 145 (1st Quarter Honors Intro. Chem., 1)
Chem 152 (2nd quarter Intro. Chem., 5)
Chem 162 (3rd quarter Intro. Chem, 1)
Chem 396 (Scientific Presentation Skills, 2)
Chem 399 (Independent Study, 3)
Chem 455 (Quantum Mechanics, 2)
Chem 457 (Statistical Mechanics, 6)
Chem 461 (Physical Chemistry Lab., 18)
Chem 473 (K-12 Content Outreach, 2)
Chem 550 (Graduate Quantum Mechanics, 4)

II. Department and University Service (since previous 10-year review):

Departmental Committees:

Associate Chair, Undergraduate Program (2005-present)
Physical Chemistry Faculty Search (2000-2007)
Solar Search Committee (2008-2009)
Undergraduate Laboratory Curriculum (1999 to 2005)
Undergraduate Curriculum Committee (2003-present)
Graduate Recruiting Committee (1996-2002)

College and University Committees:

Earth and Space Sciences 10-Year Review Committee (2011, Chair)
First-Year Programs (2010-present)
Arts and Sciences Curriculum Committee (2003 -2007, Chair 2005-2007)
Sound Transit Impact Advisory Board (2001-2008)
Faculty Fellows Program (2003-present, Senior Fellow in 2005 to present)
Freshman Orientation Seminar Series (2003-2007)
A&S Dean Search Committee (2007-2008)
Goldwater Selection Committee (2000)

40 Graduate Supervisory Committees: (does not include students in faculty member's group)

III. Research Group (current):

7	graduate students	1	Postdoctoral associates	12	Ph.D.s granted (career total)
2	undergraduate students	0	other Visiting Faculty		

IV. Invited Lectures: career total 74

Western Spectroscopy Association, Monterey, CA 2012
McGill University, Montreal, Quebec 2012
Murdock Charitable Trust Conference (Keynote Address), Vancouver, WA 2011
University of California, Berkeley, CA 2011
University of California, San Diego, CA 2011
National ACS Meeting, Denver, CO 2011 (Ultrafast Reaction Dynamics Symposium)
National ACS Meeting, Denver, CO 2011 (Paul Barbara Symposium)
International Conference on Raman Spectroscopy, Boston, MA 2010
Workshop on Single-Molecule Microscopy, Telluride, CO 2009
Florida State University, Tallahassee, FL 2008 (departmental colloquium)
University of Minnesota, Mpls., MN 2008
University of Wisconsin, Madison, WI, 2007
University of Arizona, Tucson, AZ, 2007
University of Colorado, Boulder, CO, 2007
International Conference on Photonics, Friday Harbor, WA, 2007
Regional Physical Chemistry Symposium, Kobe, Japan, 2007
Conference on Molecular Reaction Dynamics, Kobe, Japan, 2007
University of Buffalo, Buffalo, NY 2007
University of Notre Dame, South Bend, IN 2007
Walla Walla University, Walla Walla, WA 2007
NSF-REU Directors Workshop, Portland, OR 2006

International Conference on Raman Spectroscopy, Yokohama, Japan 2006
International Conference on Time-Resolved Vibrational Spectroscopy, Tokyo, Japan 2006
Gordon Research Conference on Vibrational Spectroscopy, Biddeford, ME 2006
University of Alberta, Edmonton, Alberta, Canada 2006
12th International Conference on Time-Resolved Vibrational Spectroscopy, Washington DC, 2005
DOE Single Molecule Workshop, Washington, DC 2005
Western Washington University, Bellingham, WA 2004
Gordon Research Conference on Vibrational Spectroscopy, Bristol, RI 2004
National APS Meeting, Montreal, Quebec, 2004
Gordon Research Conference on Physics and Chemistry of Liquids, 2003
Argonne National Labs, Argonne, IL 2003
Kansas State University, Manhattan, KS 2003
University of Victoria, Victoria, BC, Canada 2003
Los Alamos National Laboratories, Los Alamos, NM 2002
University of New Mexico, Albuquerque, NM 2002
University of Colorado, Boulder, CO 2002
University of Southern California, Los Angeles, CA 2001
The Ohio State University, Columbus, OH 2001
FACCS Meeting, Detroit, MI 2001
10th International Conference on Time-Resolved Vibrational Spectroscopy, Okazaki, Japan 2001
Dynamics of Molecular Collisions, Copper Mountain, CO 2001
Oregon State University, Corvallis, OR 2001
Michigan State University, Lansing, MI 2001
University of Notre Dame, South Bend, IN 2001
Susquehanna University, Selinsgrove, PA 2001
Bucknell University, Lewisburg, PA 2001
Western Spectroscopy Association, Monterey, CA 2001
University of California, Santa Cruz, CA 2000
University of Oregon, Eugene, OR 2000
University of California, Irvine, CA 2000
National APS Meeting, Minneapolis, MN 2000
National ACS Meeting, Washington D.C. 2000
International Conference on Pulsed Investigations in Chemistry, Biology and Physics, Leba, Poland 2000
University of Texas, Austin, TX 2000.*University of California, Berkeley, CA 2000

V. Publications: career total [120] in press [0] submitted [0] book chapters, reviews [12]

Since 2006:

E. Riley, C. F. Craig, B. Matson, B. Kahr, and P. J. Reid, "Blinking and Proton Transfer: Isotopic Substitution Studies of Single VR Molecules Isolated in Potassium Acid Phthalate, "Chemical Physics Letters (invited feature article), in preparation.

D. H. Bale, B. E. Eichinger, B. H. Robinson, and P. J. Reid, "Dielectric Dependence of the First Molecular Hyperpolarizability for Electro-Optic Chromophores," Journal of Physical Chemistry B, *115*, 3505-3513 (2011).

E. Riley, C. Bingham, E. Bott, B. Kahr, and P. J. Reid, "Two Mechanisms for Fluorescence Intermittency of Single Violamine R Molecules," Physical Chemistry Chemical Physics, *13*, 1879-1887 (2011).

B. C. Olbricht, P. A. Sullivan, B. H. Robinson, P. J. Reid, and L. R. Dalton, "Measuring Order in Contact-Poled Organic Electro-Optic Materials with Variable-Angle Polarization-Referenced Absorption Spectroscopy (VAPRAS)", Journal of Physical Chemistry B,115, 231-241 (2011).

E. Bott, E. Riley, B. Kahr, and P. J. Reid, "Unraveling the Dispersed Kinetics of Dichlorofluorescein in Potassium Hydrogen Phthalate Crystals," Journal of Physical Chemistry A, *114*, 7331-7337 (2010).

T. Engel and P. J. Reid, *Thermodynamics, Statistical Thermodynamics, and Kinetics, 2nd Edition*, Prentice Hall: Upper Saddle River, NJ, 2010.

T. Engel and P. J. Reid, *Physical Chemistry, 2nd Edition,* Prentice Hall: Upper Saddle River, NJ, 2010.

D. L. Sluss, C. Bingham, M. Burr, E. Bott, E. Riley, and P. J. Reid, "Temperature Dependent Fluorescence Intermittency for Single Molecules of Violamine R in Poly(vinyl alcohol)," Journal of Materials Chemistry, *19*, 7561-7566 (2009).

A. Barbon, E. D. Bott, M. Brustolon, M. Fabris, B. Kahr, W. Kaminsky, P. J. Reid, S. Wong, K. L. Wustholz, and R. Zanre, "Triplet States of nonlinear Optical Chromophore DCM in Single Crystals of Potassium Hydrogen Phthalate and Their Relationship to Single Molecule Dark States," Journal of the American Chemical Society, *131*, 11548-11557 (2009).

E. Bott, E. Riley, B. Kahr, and P. J. Reid, "Proton-Transfer Mechanism for Dispersed Decay Kinetics of Single Molecules Isolated in Potassium Hydrogen Phthalate," ACS Nano, *3*, 2403-2411 (2009).

P. A. Sullivan, H. L. Rommel, Y. Takimoto, S. R. Hammond, D. H. Bale, B. C. Olbricht, Y Liao, J. Rehr, B. E. Eichinger, A. K.-Y. Jen, P. J. Reid, L. R. Dalton, and B. H. Robinson, "Modeling the Optical Behavior of Complex Organic Media: From Molecules to Materials," Journal of Physical Chemistry B, *113*, 15581-15588 (2009).

T. Bixby, J. Patterson, J. Bolinger, and P. J. Reid, "Femtosecond Pump-Probe Studies of Actinic-Wavelength Dependence in Aqueous Chlorine Dioxide Photochemistry," Journal of Chemical Physics, *130*, 154503 (2009).

T. Bixby, J. Patterson and P. J. Reid, "Time-Resolved Infrared Absorption Studies of Nitrosyl Chloride Photochemistry in Acetonitrile," Journal of Physical Chemistry A, *113*, 3886-3894 (2009).

T. Bullard, K. L. Wustholz, M. Robertson, J. Freudenthal, P. J. Reid and B. Kahr, "Role of Kinks in Dyeing Crystals: Confocal Luminescence Microscopy from Single Molecules to Squared Centimeters," Crystal Growth & Design, *9*, 982-990 (2009).

T. Engel, G. Drobny and P. J. Reid, *Physical Chemistry for the Life Sciences*, Pearson Prentice Hall, Upper Saddle River, NJ, 2008.

Y. J. Cheng, J. D. Luo, S. Huang, X. H. Zhou, Z. W. Shi, T. D. Kim, D. H. Bale, S. Takahashi, A. Yick, B. M. Polishak, S. H. Jang, L. R. Dalton, P. J. Reid, W. H. Steier, A. K.-Y. Jen, "Donor-Acceptor Thiolated Polyenic Chromophores Exhibiting Large Optical Nonlinearity and Excellent Photostability," Chemistry of Materials, *20*, 5047-5054 (2008).

B. C. Olbricht, P. A. Sullivan, G. A. Wen, A. A. Mistry, J. A. Davies, T. R. Ewy, B. E. Eichinger, B. H. Robinson, P. J. Reid, and L. R. Dalton, "Laser-Assisted Poling of Binary Chromophore Materials," Journal of Physical Chemistry C, *112*, 7983-7988 (2008).

K. L. Wustholz, D. R. B. Sluss, B. Kahr and P. J. Reid, "Applications of Single-Molecule Microscopy to Problems in Dyed Composite Materials," International Reviews of Physical Chemistry (invited), *27*, 167-200 (2008).

K. L. Wustholz, B. Kahr, and P. J. Reid, "Memory and Diffusion in Single-Molecule Emission," Journal of Physical Chemistry C, *112*, 7877-7885 (2008).

K. N. Gunnerson, C. Brooksby, O. V. Prezhdo, and P. J. Reid, "Nonequilibrium Versus Equilibrium Molecular Dynamics Studies of Solvation Dynamics After OClO Photoexcitation," Journal of Chemical Physics, *127*, 164510 (2007).

D. Rezzonico, M. Jazbinsek, C. Bosshard, P. Gunter, D. H. Bale, Y. Liao, L. R. Dalton, and P. J. Reid, "Photostability Studies of π-Conjugated Chromophores with Resonant and Nonresonant Light Excitation for Long-Life Polymeric Telecommunication Devices," Journal of the Optical Society of America B, *24*, 2199-2207 (2007).

K. L. Wustholz, E. D. Bott, C. M Isborn, X. Li, B. Kahr, and P. J. Reid, "Dispersive Kinetics from Single Molecules Oriented in Potassium Acid Phthalate Crystals," Journal of Physical Chemistry C, 111, 9146-9156 (2007).

C. C. Cooksey, K. Johnson, and P. J. Reid, "Femtosecond Pump-Probe Studies of NOCl Photochemistry in Solution," Journal of Physical Chemistry A, 110, 8613-8622 (2006).

VI. Grant Activity (since previous 10-year review):

Pending

NSF-REU	Hooked on Photonics: A multi-institution REU program in organic electronics and photonics	*In prep*	$850,000
NSF-AIR	Commercialization of a low-drive voltage electro optical modulator		$1,000,000

Current

NSF	Science and Technology Center: CMDITR (PI: Reid)	5/07-4/12	$150,000/y (PI)
NSF-DMR	Enhancing Molecular Alignment and Photostability In Organic EO Materials Using Single Molecule Microscopy	8/10-7/13	$494,892
NSF-REU	Hooked on Photonics: A research experience for undergraduates	5/09-4/12	$345,000

Past

DARPA	MORPH: Non-linear optical materials (supp.)	8/07-12/08	$144,000
DARPA	MORPH: Non-linear optical materials	8/06-12/08	$120,000/yr
NSF	Hooked on Photonics: an research experience for undergraduates	6/05-5/08	$216,000
NSF	Understanding the Role of Solvent in Condensed Phase Environmental Photochemistry	7/04-6/08	$361,958
ACS-PRF	Time-Resolved Spectroscopic Studies of Halooxide and Nitrosyl Halide Photoisomerization	9/03-8/06	$120,000
NSF	Science and Technology Center: NLO (PI: Dalton)	5/02-4/07	$60,000/y (PR)
Lumera	NLO Contractual Research	5/01-5/03	$150,000
ACS-PRF	Geminate Recombination and Intramolecular Energy Redistribution in Small Molecules	6/01-9/03	$60,000
NSF	Elucidation the Reaction Dynamics of Environmentally Important Compounds	5/01-4/04	$332,000
UW RRF	Spectroscopic Investigations of Chemical Reaction Dynamics in Supercritical Fluids	8/00-7/01	$28,900
NSF	Construction of an Ultrafast Optical Spectroscopy Center at the UW	8/00	$249,242

VII. Honors and Awards:

University Distinguished Teaching Award (Washington)	2005
Departmental Teaching Award (Washington)	2004
Harris Award (for departmental service, Washington)	2000
Alfred P. Sloan Fellowship (Washington)	1999
Research Corp. College Cottrell Fellowship (Washington)	1998
National Science Foundation CAREER Award (Washington)	1997
Camille and Henry Dreyfus New Faculty Award (Washington)	1995

VIII. Additional Comments on Research, Teaching, and Service:

Academic Posts:

Director, CMDITR	Univ. of Washington	Sept. 2007-present
Co-Director, CMDITR	Univ. of Washington	Sept. 2006-Sept. 2007
Assoc. Director of Education, CMDITR	Univ. of Washington	Jan 2006-Aug. 2006
Assoc. Chair, Undergraduate Program	Univ. of Washington	March 2005-present
Professor	Univ. of Washington	June 2004-present

Consultant:

Pacific Northwest National Labs Users Advisory Committee (1999-2005)
Los Alamos CLS Panel (2002-2004)
Materials Sciences Department, UW (1995-1998)
Bedford-Freeman-Worth Publishers
Benjamin Cummins Publishers
Pearson Publishers
McGraw-Hill Publishers

Workshops:

Graduate Education Discussion, Murdock Foundation, 2010
Materials Science Ph.D. Program Orientation, Norfolk State University, 2008
REU Directors Workshop, Autumn 2006
Materials Summer Workshop, NSF-STC Summer, 2003

Summary of Selected Professional Activities

Name: William P. Reinhardt — Date of Revised Vitae: 6/2011
Rank: Professor — Date of Ph.D.: 1968 — Date of UW hire: 1991 — Date of last promotion: N/A

I. Courses Taught (only list course number & times taught):

CHEM: 152(5),145(6),155(5),455(7),456(3),457(2),475(2),552(11),565(2).
Research: CHEM 199,399,499, 600, 800; Phys. 399,600,800.
GIS (Discovery Seminar) 180(3); Robinson Center Sum. Chem. Prep (3).

II. Department and University Service:

Departmental Committees (selected):

Assoc. Chair for Undergraduate Program 1993-96
Head, Faculty Search Committee(s), 1998-2000
Chair's Advisory Committee, Autumn 1998-Summer 2003
Graduate Good Standing, 2003-present.

College and University Committees (selected):

College Committee on Curriculum, Practices and Standards, A & S, 1993-97 (Chair, AY 1995-96, 1996-97)
Internal Review Panel for the Institute for Nuclear Theory, Winter 1994
University Curriculum Policy Board, June 1995-97
Chair, Dean's Committee to Select the Chair of Mathematics, Winter-Spring 2001
Member Arts and Sciences Dean's Advisory Board, 2003-date
Elected Member "College Council" of the College of Arts and Sciences, Sept 2004-08
Advisory Committee, The Robinson Center for Young Scholars, UW. 2005-08
National Advisory Panel for the UW Physics Education Group, 2008-present
Member PEG NSF Site Visit Team, 2008
Elected Member, UW Faculty Senate, 2009-12

15	Total Other Graduate Supervisory Committees: (does not include students in own group)

III. Research Group (current):

7	graduate students	26	Postdoctoral associates(career)	32	Ph.D.s granted (career total)
8	undergraduate students	0	other Visiting Faculty		

IV. Invited Lectures: career total 197 (since July 1991)

Recent only:

Invited Lecturer, 4th Meeting of the Saudi Physical Society, SPS4, Riyadh, Saudi Arabia, Plenary Lecture November 11, 2008, Specialized Lecture November, 12, 2008

Pinhead "Town Talk", a public lecture with panel discussion, on "*Chaos and Climate Change,*" July 23, 2009, Telluride, CO.

Keynote Lecturer, "Wavepackets, Chaos, and Scattering: From Chemistry to Physics and Back", ITAMP, Harvard-Smithsonian, Oct. 7-10, 2010

Plenary Lecturer, "Special Functions 21", SIAM-NIST, Washington DC, April 6-8, 2011

Invited Lecturer, DAMOP 2011, "Quantum Circuits," Atlanta, GA, June 13-17, 2011

Roosevelt High School, Seattle, WA: *Quantum Mechanics: is it waves or particles?* A talk for students and parents, sponsored by the Roosevelt Science Boosters, November 12, 2009

Creative Retirement Institute, Everett WA, a six hour lecture series on *Chaos, Cellular Automata, and Quantum Mechanics*, Winter 2010

Physics Seminar, Bucknell University, Lewisburg, PA, April 26, 2010

Public Lecture: "*A tour of real and imaginary universes: Jorge Luis Borges meets Stephen Hawking*," Bucknell University, Lewisbiurg, PA, April, 2010

Physical Chemistry Seminar, University of Maryland, College Park, May 2010

NIST Public Lecture, "*A tour of real and imaginary universes: Jorge Luis Borges meets Stephen Hawking*," June 10, 2010

NIST SURF (Summer Research Students) Lecture, "*Gaseous BECs and Phase Engineered Solitons*," June 30, 2010
Statistical Physics Seminar, "*Quantum Solitons*," U of MD, September 7, 2010
Chemical Physics Seminar, "*Quantum Chemistry meets Quantum Physics*," University of Colorado, Boulder, August 26th, 2011.

Other lectures of special interest

UW Dept. of Chem. "Science at the Movies: *Groundhog Day and the many worlds interpretation of quantum mechanics,*" May 22, 2006
Seattle "Skeptics Club", Quantum Mechanics, New-Age Medicine, and Reality, Jan. 19, 2006
Chemical Physics Colloq., Czech Academy of Sciences, Prague, CZ, January 22, 2004
Mathematics Colloquium, University of California, Berkeley, April 8, 2004
Atomic Physics Seminar, ENS, Paris France, October 2002
"Introduction to Concepts of Plasma Fusion", a demonstration-workshop for 32 6th graders from Rainbow Elementary School, Redmond, WA, October 1999
Physics Colloquium Research School of Physics, Australian National University, October, 1997
Physical Chemistry Seminar, Research School of Chemistry, Australian National University, Canberra, October, 1997;
Evening General Lecture: "Chaos, a Scientific Revolution," University College, University of Melbourne, October, 1997
Physics Colloquium, University of Queensland, Brisbane, November, 1997
Physical Chemistry Seminar, University of Queensland, Brisbane, November, 1997
Physics Colloquium, University of Melbourne, November, 1997
Physical Chemistry Seminar (the Wilsmore Lecture) University of Melbourne, December, 1997
Downtown Seattle Rotary Club, "Chaos, a New Science", Nov 6, 1996
Physical Chemistry Seminar, Oxford University, UK, Oct 3, 1995
Optimization Theory Seminar, Orstead Institute, U. of Copenhagen, Denmark, Oct 5, 1995
Physical Chemistry Seminar, Cambridge University, UK, Oct 11, 1995.

V. Publications: career total [165] in press [ ] submitted [5] book chapters, reviews [48]

Recent and representative (out of 213), current H# is currently 47:

1. Douglas K. Faust and William P. Reinhardt, "*Anaylsis of a Bose-Einstein Condensate Double-Well Atom Interferometer*," Phys. Rev. Lett. **105**, 240404 (2010).

2. *"NIST Handbook of Mathematical Functions*," and the Web version "*The NIST Digital Library of Mathematical Functions*," W. P. Reinhardt, *Associate Editor*, and co-author of 3 chapters (*Theta, Jacobi, and Weierstrass Elliptic Functions)*, Cambridge Univ. Press, May 2010; and "http://dlmf.nist.gov."

3. William P. Reinhardt, "*Macroscopic Quantum Systems*," a chapter in the Annenberg-Harvard-Smithsonian Web Project *Physics for the 21st Century*, see "http://www.learner.org/courses/physics/", Fall 2010.

4. W. P. Reinhardt, Cynthia A. Stanich, and Cory D. Schallaci, *"Schrődinger Cats in Double Well Bose Condensates: Modeling their Collapse and Detection via Quantum State Diffusion,"* Proceedings of the 4th Saudi Physical Society Meeting, Riyadh, Saudi Arabia, November 2008, Applied Math & Information Science 3, 273-299, (2009).

5. David J. Masiello and William P. Reinhardt, *"Time-dependent quantum many-body theory of identical bosons in a double well: Early-time ballistic interferences of fragmented and number entangled states,"* Phys. Rev. A 76, 043612 (2007).

6. Sarah B. McKagan, D. Feder and W. P. Reinhardt, "*Mean-field effects may mimic number squeezing in Bose-Einstein condensates in optical lattice,"* Physical Review A 74, 013612(1-13), **2006.**

7. R. Blumel and W. P. Reinhardt, "*Chaos in Atomic Physics,*" Cambridge University Monographs in Atomic, Molecular, and Chemical Physics, Vol. 10. Cambridge U. Press, UK, Paper Edition, 2005, Hardback, 1997, 326 pp.

8. K. Mahmud, Heidi Perry, and W. P. Reinhardt, "*Phase engineering of controlled entangled number states in a single component Bose-Einstein condensate in a double well*," J. Phys B, 36, L265-L272, **2003.**

9. J. Brand and W. P. Reinhardt, "*Generating ring currents, solitons, and vortices by stirring a Bose-Einstein condensate in a toroidal trap*," *Journal of Physics B*, 34, L113 (2001).

10. W. P. Reinhardt, Mark A. Miller, and Lynn M. Amon, "*Why is it so Difficult to Simulate Entropies, Free Energies and Their Differences?*," *Accts. Chem. Res*. 34, 607-614 (2001).

11. W. P. Reinhardt, and S. B. McKinney, "*Chaos in the Bose Condensate," Physica Scripta*, T90, 202-211 (2001).

12. Mark A. Miller and W. P. Reinhardt, "*Efficient Free Energy Calculations by Variationally Optimized Metric Scaling: Concepts and Applications to the Volume Dependence of Cluster Free Energies and to Solid-Solid Phase Transitions*," *Journal of Chemical Physics*, 113, 7035 (2000).

13. J. Denschlag, J. E. Simsarian, D. L. Feder, C. W. Clark, L. A. Collins, J. Cubizolles, L. Deng, E. W. Hagley, K. Helmerson, W. P. Reinhardt, S. L. Rolston, B. I. Schneider and W. D. Phillips, "*Generating Solitons by Phase Engineering of a Bose-Einstein Condensate*," *Science*, 287, 97-101 (2000).
    - (This paper on observation of solitons in Bose condensates, which was motivated by paper #16, below, is currently, as of Winter 2011, "*the most referenced paper in matter-wave-optics*")

14. L. D. Carr, C. W. Clark, and W. P. Reinhardt, "*Stationary States of the One-Dimensional Nonlinear Schrodinger Equation: I. Case of Repulsive Non-Linearity*," *Physical Review A*, 62, 063610 (10 pages) (2000).

15. L. D. Carr, C. W. Clark, and W. P. Reinhardt, "*Stationary States of the One-Dimensional Nonlinear Schrodinger Equation: II. Case of Attractive Non-Linearity*," *Physical Review A*, 62, 063611 (10 pages) (2000).

16. W. P. Reinhardt and C. W. Clark, "*Soliton Dynamics in the Collisions of Bose-Einstein Condensates: an Analog of the Josephson Effect*," *J. Phys. B*. 30, L785-L789 (1997).

17. Caren Seagraves and W. P. Reinhardt, "*Lattice Models of Transmembrane Proteins*," *J. Chem. Phys.,* 103, 5091 (1995).

18. J. Hunter III, Thomas Davis and W. P. Reinhardt, "*A Finite-Time Variational Method for Determining Optimal Paths and Obtaining Bounds on Free Energy Changes from Computer Simulation," J. Chem. Phys*. 99, 6856-64 (1993).

19. R. Blumel, I. Davidson, and W. P. Reinhardt, "*Experimental Generation of Random Surface Waves on Thin Films of Water*," *Phys. Rev. A* 45, 2641 (1992).

20. E. L. Sibert III, W. P. Reinhardt, and J. T. Hynes, "*Intramolecular Vibrational Relaxation and Spectra of CH and CD Overtones in Benzene and Perdeuterobenzene*," *J. Chem. Phys.*, 81, 1115-1134 (1984).

21. W. P. Reinhardt, "*Complex Coordinates in the Theory of Atomic and Molecular Structure and Dynamics*," *Ann. Rev. Phys. Chem.*, 33, 223-255 (1982).

22. H. A. Yamani and W. P. Reinhardt, "L^2 Discretizations of the Continuum: Radial Kinetic Energy and Coulomb Hamiltonian," *Phys. Rev. A*, 11, 1144-1156 (1975).

23. E. J. Heller, T. N. Rescigno, and W. P. Reinhardt, "*Extraction of Scattering Information from Fredholm Determinants Calculated in an L^2 Basis: A Chebyschev Discretization of the Continuum," Phys. Rev. A*, 8, 2946-2951 (1973).

24. W. P. Reinhardt, D. W. Oxtoby, and T. N. Rescigno, "*Computation of Elastic Scattering Phase Shifts via Analytic Continuation of Fredholm Determinants Constructed using an L^2 Basis*," *Phys. Rev. Letters*, 28, 401-403 (1972).

25. J. D. Doll and W. P. Reinhardt, "*Many-Body Green's Functions for Finite, Nonuniform Systems: Applications to Closed Shell Atoms*," *J. Chem. Phys.*, 57, 1169-1184 (1972).

VI. Grant Activity:

Overview of grant activity 1991-present:

Supported by NSF Theoretical and Computational Chemistry, NSF Chemistry Instrumentation, NSF Theoretical Physics, NSF TeraGrid (supercomputer access), National Institute for Standard and Technology, Royalty Research Fund, von Humboldt Foundation, DOE (in support of theoretical scientists from the FSU).

VII. Honors and Awards (selected):

Phi Beta Kappa (1963)
Camille and Henry Dreyfus Teacher-Scholar Award (1972)
Alfred P. Sloan Fellow, 1972-1974
Fresenius Award of Phi Lambda Upsilon (National Chemistry Honorary Society) (1977)
J. S. Guggenheim Memorial Fellow (1978)
Sigma Xi National Lecturer (1980-1982)
Joint Institute for Laboratory Astrophysics, NBS-CU Boulder, Fellow, 1974-1984
University of Colorado, Boulder, Chemistry, Dept. Chairman 1977-1980
Fellow, American Physical Society, Elected (1980)
Fellow, AAAS, Elected (1983)
Master of Arts (Hon.), University of Pennsylvania (June 1985)
University of Pennsylvania, Chemistry, Dept. Chairman, 1985-1988
Telluride Sum. Research Ctr., Telluride, CO, President, 1986-1989
D. Michael Crow Professor of Chemistry at the University of Pennsylvania (1987-1990)
Université de Pierre et Marie Curie (Paris VI), Prof. Invité, 1991 (spring-summer)
Visiting Scientist, Physics Lab, National Institute for Standards and Technology (NIST), frequently, Summer 1995-date.
Wilsmore Fellow, University of Melbourne, Autumn, 1997
Fulbright Senior Scholar, Aug-Dec 1997, Melbourne, Australia
Visiting Professor of Chemistry, Harvard University, Winter-Spring 1998
Pacific Northwest National Laboratory, Affiliate Staff Scientist, Oct 1996-
Fellow of Phi Beta Kappa, 1998-present
Fellow of the Institute of Physics, (U.K.), May, 2000-present
Davidson Lectureship, University of Kansas, Oct. 2000
Kohler Lecturer, UC Riverside, Spring 2002
Phi Beta Kappa Visiting Scholar, AY 2002-03, U. Tenn, U. Kentucky, Bowling Green State Univ., Luther College, Macalester College, Gustavus Adolphus College, Augustana College, University of Maine at Orono. 24 lectures and classes/seminars held under this Phi Beta Kappa program
Phi Beta Kappa Fellows Panel of Distinguished Speakers, 2004-present
R. Stephen Berry Public Lecturer, Telluride CO, August 10, 2004
UW Department of Chemistry: “Outstanding Chemistry Teacher Award,” (first ever at UW!); Spring 2004
Harvard-MIT Center for Ultra-Cold Atoms, Visiting Scholar, March 2005
Bertman Lecturer in Physics, Wesleyan University, CT, April 2005
Phi Beta Kappa, Couper Scholar, 2006-08, lectures at Xavier (New Orleans), and Dillard (New Orleans), both following "Katrina"
Visiting Fellow, Joint Quantum Institute, University of Maryland-NIST, Spring-Summer 2010

VIII. Additional Comments on Research, Teaching, and Service:

Have presented "very well received" **public lectures** in the physical sciences to well over 1200 "adult and young adult" listeners in the past decade; have organized a highly successful Walker-Ames Lecture sponsored by 7 campus units, none being my home department (Charles Falco, Art and Optics, Winter 2009); have served on five special NSF and NRC panels, and about to serve on a 6th: NSF panel on the *Future of Atomic, Molecular, and Optical Theoretical Science*, August 18-19, 2011, Arlington, VA; Initiator, official Assoc. Editor, unofficial Gadfly, and Author of Three Chapters, “the Digital Library of Mathematical Functions, or DLMF” a 12 year project, finished May 2010, this replaces the NBS Handbook of Mathematical Functions, the leading, and most referenced such handbook in the world; Served for extended periods on the Editorial Boards of Physical Review A, and J. Physics. B (UK); am working with a currently highly active group to "fundamentally change" the relationship between UW and the PNNL; am working with Associate Chair Phil Reid to institute a novel advising and tutorial, and homework web based system for "all of first year chemistry."

Summary of Selected Professional Activities

Name: Bruce H. Robinson — Date of Revised Vita: 6/2011

Rank: Professor — Date of Ph.D.: 1975 — Date of UW hire: 1980 — Date of last promotion: 1992

I. Courses Taught:

Chem 142(3) Chem 144 (1) Chem 152(2) Chem 162(2) Chem 452(2) Chem 455(2) Chem 456(5) Chem 550(4)

II. Department and University Service:

Departmental Committees: Graduate Recruiting 1994-2000, Academic Personnel 1998-2003, Library 2003-09, Undergraduate Services 2003-present; Chair, Second Year Physical Chemistry Exams 2010-11.

College and University Committees: Graduate School Representative for ~10 Ph.D. candidates.

~13	Total Other Graduate Supervisory Committees: (does not include students in own group)

III. Research Group (current):

2	graduate students	0	Postdoctoral associates	9	Ph.D.s granted (career total)
1	undergraduate students	0	other Visiting Faculty	1	Sr. Staff Scientist

IV. Invited Lectures: career total Unk — 38 In the last 10 years.

V. Publications: career total 168 — in press 0 — submitted 1 — book chapters, reviews 14

1. Bale, D. H.; Eichinger, B. E.; Liang, W.; Li, X.; Dalton, L. R.; Robinson, B. H.; Reid, P. J., *The Dielectric Dependence of the First Molecular Hyperpolarizability for Electro-optic Chromophores J. Phys. Chem. B,* **2011,** 115, (13), 3505-3513.
2. Olbricht, B. C.; Sullivan, P. A.; Dennis, P. C.; Hurst, J. T.; Johnson, L. E.; Benight, S. J.; Davies, J. A.; Chen, A.; Eichinger, B. E.; Reid, P. J.; Dalton, L. R.; Robinson, B. H., *Measuring Order in Contact-Poled Organic Electrooptic Materials with Variable-Angle Polarization-Referenced Absorption Spectroscopy (VAPRAS). J. Phys. Chem. B,* **2011,** 115, (2), 231-241.
3. Benight, S. J.; Johnson, L. E.; Barnes, R. S.; Olbricht, B. C.; Bale, D. H.; Eichinger, B. E.; Dalton, L. R.; Sullivan, P. A.; Robinson, B. H., *Reduced Dimensionality in Organic Electro-Optic Materials. J. Phys. Chem. B,* **2010,** 114, 11949–11956.
4. Dalton, L. R.; Sullivan, P. A.; Bale, D. H.; Olbricht, B. C.; Davies, J. A.; Benight, S. J.; Kosilkin, I.; Robinson, B. H.; Eichinger, B. E.; Jen, A. K.-Y., Organic Electro-Optic Materials: Understanding Structure/Function Relationships Critical to the Optimization of Electro-Optic Activity. In *Organic Thin Films for Photonics Applications*, Herman, W.; Foulger, S., Eds. ACS Symposium Series: Washington, DC, 2010; Vol. 1-39, 13-33.
5. Grote, J. G.; Dalton, L. R.; Sullivan, P. A.; Robinson, B. H.; Eichinger, B. E.; Jen, A. K.-Y.; Benight, I.; Losilkin, I.; Bale, D. H., *Definition of Critical Structure/Function Relationships and Integration Issues for Organic Electro-Optic Materials. Nonlinear Optics and Quantum Optics,* **2010,** 40, 15-26.
6. Johnson, L. E.; Barnes, R. S.; Draxler, T. E.; Eichinger, B. E.; Robinson, B. H., *Dielectric Constants of Simple Liquids: Stockmayer and Ellipsoidal Fluids. J. Phys. Chem. B.,* **2010,** 114, (25), 8431-8440.
7. Whitaker, K. M.; Ochsenbein, S. T.; Smith, A. L.; Echodu, D. C.; Robinson B.H.; Gamelin, D. R., *Hyperfine Coupling in Colloidal n-Type ZnO Quantum Dots: Effects on Electron Spin Relaxation. J. Phys. Chem. C,* **2010,** 114, (34), 14467-14472.
8. Dalton, L. R.; Sullivan, P. A.; Bale, D. H.; Hammond, S. R.; Olbricht, B. C.; Rommel, H.; Eichinger, B. E.; Robinson, B. H., Organic Photonic Materials. In *Tutorials in Complex Photonic Media*, Noginov, M.; McCall, M. W.; Dewar, G.; Zheludev, N. I., Eds. SPIE Press: Bellingham, WA, 2009; pp 535-574.
9. Smith, A. L.; Cekan, P.; Brewood, G. P.; Okonogi, T. M.; Alemayehu, S.; Hustedt, E. J.; Benight, A. S.; Sigurdsson, S. T.; Robinson, B. H., *Conformational equilibria of bulged sites in duplex DNA studied by EPR spectroscopy*. *J Phys Chem B,* **2009,** 113, (9), 2664-75.
10. Sullivan, P. A.; Rommel, H. L.; Takimoto, Y.; Hammond, S. R.; Bale, D. H.; Olbricht, B. C.; Liao, Y.; Rehr, J.; Eichinger, B. E.; Jen, A. K.; Reid, P. J.; Dalton, L. R.; Robinson, B. H., *Modeling the optical behavior of complex organic media: from molecules to materials*. *J Phys Chem B,* **2009,** 113, (47), 15581-8.
11. Davies, J. A.; Elangovan, A.; Sullivan, P. A.; Olbricht, B. C.; Bale, D. H.; Ewy, T. R.; Isborn, C. M.; Eichinger, B. E.; Robinson, B. H.; Reid, P. J.; Li, X.; Dalton, L. R., *Rational enhancement of second-order nonlinearity: bis-(4-methoxyphenyl)hetero-aryl-amino donor-based chromophores: design, synthesis, and electrooptic activity*. *J Am Chem Soc,* **2008,** 130, (32), 10565-75.
12. Halter, M.; Liao, Y.; Plocinik, R. M.; Coffey, D. C.; Bhattacharjee, S.; Mazur, U.; Simpson, G. J.; Robinson, B. H.; Keller, S. L., *Molecular Self-Assembly of Mixed High-Beta Zwitterionic and Neutral Ground-State NLO Chromophores. Chem. Mater.*, **2008,** 20, (5), 1778-1787.
13. Olbricht, B. C.; Sullivan, P. A.; Mistry, A. A.; Davies, J. A.; Ewy, T. R.; Eichinger, B. E.; Robinson, B. H.; Reid, P. J.; Dalton, L. R., *Laser-Assisted Poling of Binary Chromophore Materials. J. Phys. Chem. C.*, **2008,** 112, (21), 7983-7988.
14. Smith, A. L.; Cekan, P.; Rangel, D. P.; Sigurdsson, S. T.; Mailer, C.; Robinson, B. H., *Theory for spin-lattice relaxation of spin probes on weakly deformable DNA. J Phys Chem B,* **2008,** 112, (30), 9219-36.
15. Takimoto, Y.; Isborn, C. M.; Eichinger, B. E.; Rehr, J. J.; Robinson, B. H., *Frequency and Solvent Dependence of Non-Linear Optical Properties of Molecules. J. Phys. Chem. C* **2008,** 112, (21), 8016-8021.
16. Dalton, L. R.; Sullivan, P. A.; Olbricht, B. C.; Takimoto, Y.; Rehr, J. J.; Eichinger, B. E.; Mistry, A. A.; Bale, D.; Rommel, H.; Robinson, B. In *Organic electro-optic/silicon photonic materials and devices*, Photonic Metamaterials, San Diego, CA,

USA, 2007; SPIE: San Diego, CA, USA, 2007; pp 66380I-9.
17. Isborn, C. M.; Leclercq, A.; Vila, F. D.; Dalton, L. R.; Bredas, J. L.; Eichinger, B. E.; Robinson, B. H., *Comparison of static first hyperpolarizabilities calculated with various quantum mechanical methods*. *J Phys Chem A*, **2007,** 111, (7), 1319-27.
18. Liu, W. K.; Whitaker, K. M.; Smith, A. L.; Kittilstved, K. R.; Robinson, B. H.; Gamelin, D. R., *Room-temperature electron spin dynamics in free-standing ZnO quantum dots*. *Phys Rev Lett*, **2007,** 98, (18), 186804.
19. Rommel, H. L.; Robinson, B. H., *Orientation of electro-optic chromophores under poling conditions: A spheroidal model*. *J. Phys. Chemistry, C*, **2007,** 111, (50), 18765-18777.
20. Sullivan, P. A.; Rommel, H.; Liao, Y.; Olbricht, B. C.; Akelaitis, A. J.; Firestone, K. A.; Kang, J. W.; Luo, J.; Davies, J. A.; Choi, D. H.; Eichinger, B. E.; Reid, P. J.; Chen, A.; Jen, A. K.; Robinson, B. H.; Dalton, L. R., *Theory-guided design and synthesis of multichromophore dendrimers: an analysis of the electro-optic effect*. *JACS*, **2007,** 129, (24), 7523-30.
21. Akelaitis, A.; Sullivan, P.; Sinness, J.; Hammond, S.; Liao, Y.; Lawson, R.; Takayesu, J.; Eichinger, B.; Rommel, H.; Robinson, B.; Dalton, L. In *Recent advances in organic electro-optic materials for ring micro-resonators and optical modulation*, Laser Beam Control and Applications, San Jose, CA, USA, 2006; SPIE: San Jose, CA, USA, 2006; 61010S-8.
22. Dalton, L.; Liao, Y.; Sullivan, P.; Robinson, B. In *Theoretically-inspired nanoengineering of complex photonic media*, Complex Photonic Media, San Diego, CA, USA, 2006; SPIE: San Diego, CA, USA, 2006; 63200G-7.
23. Dalton, L. R.; Jen, A. K.; Sullivan, P. A.; Liao, Y.; Eichinger, B. E.; Robinson, B. H.; Chen, A., *Theoretically-Inspired Rational Design of Electro-Optic Materials*. *Nonlinear Optics and Quantum Optics*, **2006,** 35, 1-19
24. Davidson, E. R.; Eichinger, B. E.; Robinson, B. H., *Hyperpolarizability: Calibration of theoretical methods for chloroform, water, acetonitrile, and p-nitroaniline*. *Optical Materials*, **2006,** 29, 360.
25. Isborn, C. M.; Davidson, E. R.; Robinson, B. H., *Ab initio diradical/zwitterionic polarizabilities and hyperpolarizabilities in twisted double bonds*. *J Phys Chem A*, **2006,** 110, (22), 7189-96.
26. Kinnibrugh, T. S.; Bhattacharjee, S.; Sullivan, P. A.; Isborn, C. M.; Robinson, B. H.; Eichinger, B. E., *Influence of Isomerization on Non-Linear Optical Properties of Molecules*. *J. Phys. Chem. B.*, **2006,** 110, 13512.
27. Liao, Y.; Anderson, C. A.; Sullivan, P. A.; Akelaitis, A. J.; Robinson, B. H.; Dalton, L. R., *Electro-Optical Properties of Polymers Containing Alternating Nonlinear Optical Chromophores and Bulky Spacers*. *Chem. Mater.*, **2006,** 18, 1062-1067.
28. Liao, Y.; Bhattacharjee, S.; Firestone, K. A.; Eichinger, B. E.; Paranji, R.; Anderson, C. A.; Robinson, B. H.; Reid, P. J.; Dalton, L. R., *Antiparallel-aligned neutral-ground-state and zwitterionic chromophores as a nonlinear optical material*. *J Am Chem Soc*, **2006,** 128, (21), 6847-53.
29. Liao, Y.; Firestone, K. A.; Bhattacharjee, S.; Luo, J.; Haller, M.; Hau, S.; Anderson, C. A.; Lao, D.; Eichinger, B. E.; Robinson, B. H.; Reid, P. J.; Jen, A. K.; Dalton, L. R., *Linear and nonlinear optical properties of a macrocyclic trichromophore bundle with parallel-aligned dipole moments*. *J Phys Chem B*, **2006,** 110, (11), 5434-8.
30. Nielsen, R. D.; Robinson, B. H., *The Spherical Tensor Formalism Applied to Relaxation in Magnetic Resonance*. *Concepts in Magnetic Resonance*, **2006,** 28A, 270-290
31. Sluss, D. R. B.; Wallace, P. M.; Truong, K. D.; Robinson, B. H.; Dalton, L. R.; Reid, P. J. In *Single-molecule confocal microscopy studies of electric-field induced orientation in chromophore-polymer composite materials*, Linear and Nonlinear Optics of Organic Materials VI, San Diego, CA, USA, 2006; SPIE: San Diego, CA, USA, 2006; pp 63310K-12.
32. Wallace, P. M.; Sluss, D. R.; Dalton, L. R.; Robinson, B. H.; Reid, P. J., *Single-molecule microscopy studies of electric-field poling in chromophore-polymer composite materials*. *J Phys Chem B*, **2006,** 110, (1), 75-82.
33. Bhatambrekar, N.; Hammond, S.; Sinness, J.; Clot, O.; Rommel, H.; Chen, A.; Robinson, B.; Jen, A. K.; Dalton, L. In *A novel approach to achieve higher order using pseudo-discotic chromophores in electro-optic materials and devices*, Organic Photonic Materials and Devices VII, San Jose, CA, USA, 2005; SPIE: San Jose, CA, USA, 2005; pp 322-327.
34. Dalton, L.; Robinson, B.; Jen, A.; Ried, P.; Eichinger, B.; Sullivan, P.; Akelaitis, A.; Bale, D.; Haller, M.; Luo, J.; Liu, S.; Liao, Y.; Firestone, K.; Bhatambrekar, N.; Bhattacharjee, S.; Sinness, J.; Hammond, S.; Buker, N.; Snoeberger, R.; Lingwood, M.; Rommel, H.; Amend, J.; Jang, S.-H.; Chen, A.; Steier, W. In *Electro-optic coefficients of 500 pm/V and beyond for organic materials*, Linear and Nonlinear Optics of Organic Materials V, San Diego, CA, USA, 2005; SPIE: San Diego, CA, USA, 2005; pp 593502-12.
35. Dalton, L.; Robinson, B.; Jen, A.; Ried, P.; Eichinger, B.; Sullivan, P.; Akelaitis, A.; Bale, D.; Haller, M.; Luo, J.; Liu, S.; Liao, Y.; Firestone, K.; Bhatambrekar, N.; Bhattacharjee, S.; Sinness, J.; Hammond, S.; Buker, N.; Snoeberger, R.; Lingwood, M.; Rommel, H.; Amend, J.; Jang, S.-H.; Chen, A.; Steier, W. In *Acentric lattice electro-optic materials by rational design*, Operational Characteristics and Crystal Growth of Nonlinear Optical Materials II, San Diego, CA, USA, 2005; SPIE: San Diego, CA, USA, 2005; pp 59120A-12.
36. Dalton, L.; Robinson, B.; Jen, A.; Ried, P.; Eichinger, B.; Sullivan, P.; Akelaitis, A.; Bale, D.; Haller, M.; Luo, J.; Liu, S.; Liao, Y.; Firestone, K.; Sago, A.; Bhatambrekar, N.; Bhattacharjee, S.; Sinness, J.; Hammond, S.; Buker, N.; Snoeberger, R.; Lingwood, M.; Rommel, H.; Amend, J.; Jang, S.-H.; Chen, A.; Steier, W. In *Optimizing electro-optic activity in chromophore/polymer composites and in organic chromophore glasses*, Optically Based Biological and Chemical Sensing, and Optically Based Materials for Defence, Bruges, Belgium, 2005; SPIE: Bruges, Belgium, 2005; pp 59900C-10.
37. Dalton, L.; Scherer, A.; Chen, A.; Jen, A.; Reid, P.; Robinson, B.; Eichinger, B.; Hochberg, M.; Baehr-Jones, T.; Pyajt, A.; Takayesu, J.; Sullivan, P.; Akelaitis, A.; Lawson, R.; Bale, D.; Haller, M.; Luo, J.; Liu, S.; Liao, Y.; Firestone, K.; Bhattacharjee, S.; Sinness, J.; Hammond, S.; Sgro, A.; Buker, N.; Snoeberger, R.; Lingwood, M.; Steier, W. In *Organic electro-optic glasses for WDM applications*, Active and Passive Optical Components for WDM Communications V, Boston, MA, USA, 2005; SPIE: Boston, MA, USA, 2005; pp 60140P-15.
38. Edwards, T. E.; Robinson, B. H.; Sigurdsson, S. T., *Identification of amino acids that promote specific and rigid TAR RNA-Tat protein complex formation*. *Chemistry and Biology*, **2005,** 12, (3), 329-337.
39. Jen, A.; Luo, J.; Kim, T.-D.; Chen, B.; Jang, S.-H.; Kang, J.-W.; Tucker, N. M.; Hau, S.; Tian, Y.; Ka, J.-W.; Haller, M.;

Liao, Y.; Robinson, B.; Dalton, L.; Herman, W. In *Exceptional electro-optic properties through molecular design and controlled self-assembly*, Linear and Nonlinear Optics of Organic Materials V, San Diego, CA, USA, 2005; SPIE: San Diego, CA, USA, 2005; pp 593506-13.

40. Liao, Y.; Eichinger, B. E.; Firestone, K. A.; Haller, M.; Luo, J.; Kaminsky, W.; Benedict, J. B.; Reid, P. J.; Jen, A. K.; Dalton, L. R.; Robinson, B. H., *Systematic study of the structure-property relationship of a series of ferrocenyl nonlinear optical chromophores. J Am Chem Soc,* **2005,** 127, (8), 2758-66.
41. Mailer, C.; Nielsen, R. D.; Robinson, B. H., *Explanation of spin-lattice relaxation rates of spin labels obtained with Multi-frequency Saturation Recovery EPR. J. Phys. Chem. A.,* **2005,** 109, (18), 4049-4061.
42. Nielsen, R. D.; Che, K.; Gelb, M. H.; Robinson, B. H., *A ruler for determining the position of proteins in membranes. Journal of the American Chemical Society,* **2005,** 127, (17), 6430-6442.
43. Sinness, J.; Clot, O.; Hammond, S. R.; Bhatambrekar, N.; Rommel, H. L.; Robinson, B. H.; Jen, A. K.; Dalton, L. R. In *Synthesis of Dendritic NLO Chromophores for the Improvement of Order in Electro-Optics*, Mater. Res. Soc. Symp., 2005; 2005; 121-126.
44. Dalton, L. R.; Jen, A. K.; Steier, W. H.; Robinson, B. H.; Jang, S.-H.; Clot, O.; Song, H. C.; Kuo, Y.-H.; Zhang, C.; Rabiei, P.; Ahn, S.-W.; Oh, M. C. In *Organic electro-optic materials: some unique opportunities*, Organic Photonic Materials and Devices VI, San Jose, CA, USA, 2004; SPIE: San Jose, CA, USA, 2004; pp 1-15.
45. Dalton, L. R.; Robinson, B. H.; Jen, A. K.; Ried, P.; Eichinger, B.; Jang, S.-H.; Luo, J.; Liu, S.; Liao, Y.; Firestone, K. A.; Bhatambrekar, N. P.; Bale, D.; Haller, M. A.; Bhattacharjee, S.; Schendel, J.; Sullivan, P. A.; Hammond, S.; Buker, N.; Cady, F.; Chen, A.; Steier, W. H. In *Organic electro-optic materials*, Optical Materials in Defence Systems Technology, London, United Kingdom, 2004; SPIE: London, United Kingdom, 2004; pp 93-104.
46. Haller, M.; Luo, J.; Li, H.; Kim, T.-D.; Liao, Y.; Robinson, B.H.; Dalton, L.R.; Jen, A.K.-Y., *A Novel Lattice-Hardening Process To Achieve Highly Efficient and Thermally Stable Nonlinear Optical Polymers. Macromolecules,* **2004,** 37, 688-90.
47. Liao, Y.; Robinson, B. H., *Novel applications of 2-cyanoethylanilines in the synthesis of conjugated primary and secondary anilines*. *Tetrahedron Letters,* **2004,** 45, (7), 1473-1475.
48. Luo, J.; Liu, S.; Haller, M. A.; Kang, J.-W.; Kim, T.-D.; Jang, S.-H.; Chen, B.; Tucker, N.; Li, H.; Tang, H.-Z.; Dalton, L. R.; Liao, Y.; Robinson, B. H.; Jen, A. K. In *Recent progress in developing highly efficient and thermally stable nonlinear optical polymers for electro-optics*, Organic Photonic Materials and Devices VI, San Jose, CA, USA, 2004; SPIE: San Jose, CA, USA, 2004; pp 36-43.
49. Nielsen, R.D.; Canaan, S.; Gladden, J.; Gelb, M.H.; Robinson, B.H., *A comparison of relaxation rates obtained from CW and pulsed Saturation Recovery methods*. *Journal of Magnetic Resonance,* **2004,** 169, 129-163.
50. Nielsen, R. D.; Canaan, S.; Gladden, J. A.; Gelb, M. H.; Mailer, C.; Robinson, B. H., *Comparing continuous wave progressive saturation EPR and time domain saturation recovery EPR over the entire motional range of nitroxide spin labels*. *J Magn Reson,* **2004,** 169, (1), 129-63.
51. Nielsen, R. D.; Hustedt, E. J.; Beth, A. H.; Robinson, B. H., *Formulation of Zeeman Modulation as a Signal Filter*. *Journal of Magnetic Resonance,* **2004,** 170, 345-371.
52. Nielsen, R.D.; Robinson, B.H., *A Novel Relaxation Equation of Motion*. *J. Phys. Chem.,* **2004,** 108, 1589-1600.
53. Nielsen, R. D.; Robinson, B. H., *The Effect of Field Modulation on a Simple Resonance Line Shape*. *Concepts in Magnetic Resonance,* **2004,** 223A, 38-48.
54. Nielsen, R. D.; Rommel, H. L.; Robinson, B. H., *Simulation of the Loading Parameter in Organic Nonlinear Optical Materials*. *Journal of Physical Chemistry B,* **2004,** 108, 8659-8667.
55. Rosen, G. M.; Beselman, A.; Tsai, P.; Pou, S.; Mailer, C.; Ichikawa, K.; Robinson, B. H.; Nielsen, R.; Halpern, H. J.; MacKerell, A. D., *Influence of Conformation on the EPR Spectrum of 5-5-Dimethyl-1-hydroperoxy-1-pyrrolidinyloxyl: A Spin Trapped Adduct of Superoxide*. *Journal of Organic Chemistry,* **2004,** 69, 1321-1330.
56. Sullivan, P. A.; Bhattacharjee, S.; Eichinger, B. E.; Firestone, K. A.; Robinson, B. H.; Dalton, L. R. In *Exploration of a series-type multifunctionalized nonlinear optical chromophore concept*, Organic Photonic Materials and Devices VI, San Jose, CA, USA, 2004; SPIE: San Jose, CA, USA, 2004; pp 253-259.
57. Young, C. L.; Dalton, L. R.; Robinson, B. H.; Kwiram, A. L., *Proton ENDOR Studies of Soliton Wavefunctions and Dynamics in Polyacetylenes. Journal of Physical Chemistry B,* **2004,** 108, 8682-8688.
58. Dalton, L.R.; Robinson, B.H.; Jen, A.K.-Y.; Steier, W.H.; Nielsen, R.D., *Systematic Development of High Bandwidth, Low Drive Voltage Organic Electro-Optic Devices and Their Applications*. *Opt. Mater.,* **2003,** 21, (1), 19-28.
59. Dalton, L. R.; Robinson, B. H.; Nielsen, R.; Jen, A. K.; Casmier, D.; Rabiei, P.; Steier, W. H. In *Organic electro-optics: exploiting the best of electronics and photonics*, Organic Photonic Materials and Devices V, San Jose, CA, USA, 2003; SPIE: San Jose, CA, USA, 2003; pp 508-519.
60. Mailer, C.; Robinson, B. H.; Williams, B. B.; Halpern, H. J., *Spectral Fitting: The Extraction of Crucial Information from a Spectrum and a Spectral Image*. *Magnetic Resonance In Medicine,* **2003,** 49, 1175-1180.
61. Tsai, P.; Mailer, C.; Ichikawa, K.; Pou, S.; Robinson, B. H.; Nielsen, R. D.; Halpern, H. J.; Rosen, G. M., *Esters of 5-carboxyl-5-methyl-1-pyrroline N-oxide: a Family of Spin Traps for Superoxide. J. Org. Chem.,* **2003,** 68, 7811-7817.
62. Canaan, S.; Nielsen, R.; Ghomashchi, F.; Robinson, B. H.; Gelb, M. H., *Unusual mode of binding of human group IIA secreted phospholipase A2 to anionic interfaces as studied by continuous wave and time domain electron paramagnetic resonance spectroscopy*. *J Biol Chem,* **2002,** 277, (34), 30984-90.
63. Dalton, L. R.; Robinson, B. H.; Jen, A. K.-Y.; Steier, W. H.; Nielsen, R. D., *Systematic development of high bandwidth, low drive voltage organic electro-optic devices and their applications. Opt. Mater.,* **2002,** 21, 19-28.
64. Dalton, L. R.; Robinson, B. H.; Nielsen, R.; Jen, A. K.; Steier, W. H. In *Organic electro-optics: from molecules to devices*, Linear and Nonlinear Optics of Organic Materials II, SPIE: Seattle, WA, USA, 2002; pp 1-10.

65. Jen, A. K.-Y.; Nielsen, R. D.; Robinson, B. H.; Steier, W. H.; Dalton, L. R. In *Rational Design of Organic Electro-Optic Materials*, Electrical, Optical and Magnetic Properties of Organic Solid State Materials, Pittsburgh, Pa., 2002; Materials Research Society: Pittsburgh, Pa., 2002; pp 153-160.
66. Okonogi, T. M.; Alley, S. C.; Harwood, E. A.; Hopkins, P. B.; Robinson, B. H., *Phosphate backbone neutralization increases duplex DNA flexibility: a model for protein binding*. *Proc Natl Acad Sci U S A*, **2002,** 99, (7), 4156-60.
67. Okonogi, T. M.; Alley, S. C.; Reese, A. W.; Hopkins, P. B.; Robinson, B. H., *Sequence-Dependent Dynamics of Duplex DNA: The Applicability of a Dinucleotide Model*. *Biophysical Journal*, **2002,** 83, 3446–3459.
68. Edwards, T. E.; Okonogi, T. M.; Robinson, B. H.; Sigurdsson, S. T., *Site-Specific Incorporation of Nitroxide Spin-Labels into Internal Sites of the TAR RNA; Structure-Dependent Dynamics of RNA by EPR Spectroscopy*. *Journal of the American Chemical Society*, **2001,** 123, 1527-1528.
69. Robinson, B. H.; Dalton, L. R. In *Defining performance limits for polymeric EO modulators*, Organic Photonic Materials and Devices III, San Jose, CA, USA, 2001; SPIE: San Jose, CA, USA, 2001; pp 1-9.
70. Dalton, L. R.; Robinson, B. H.; Steier, W. H.; Zhang, C. H.; Todorova, G. In *Systematic optimization of polymeric electro-optic materials*, Photonic Devices and Algorithms for Computing II, San Diego, CA, USA, 2000; SPIE: San Diego, CA, USA, 2000; pp 65-76.
71. Okonogi, T. M.; Alley, S. C.; Reese, A. W.; Hopkins, P. B.; Robinson, B. H., *Sequence-Dependent Dynamics in Duplex DNA*. *Biophysical Journal*, **2000,** 78, 2560–2571.
72. Robinson, B. H.; Dalton, L. R., *Monte Carlo Statistical Mechanical Simulations of the Competition of Intermolecular Electrostatic and Poling Field Interactions in Defining Macroscopic Electro-Optic Activity for Organic Chromophore/Polymer Materials*. *J. Phys. Chem.*, **2000,** 104, 4785-4795.
73. Robinson, B. H.; Dalton, L. R., *Monte Carlo Simulations of the Effects of a Poling Field on the Ordering of High Dipole Moment Organic Chromophores*. *Polymer Preprints*, **2000,** 41, 787-8.
74. Shi, Y.; Zhang, C.; Zhang, H.; Bechtel, J.; Dalton, L. R.; Robinson, B. H.; Steier, W. H., *Low Halfwave Voltage Polymer Electro-optic Modulators Achieved by Controlling Chromophore Shape*. *Science*, **2000,** 288, 119-122.

VI. Grant Activity:

AFRL (PI) Sponsor/subcontract: OptiMetrics Subcontract for WPAFRL	6/1/11–12/31/11	$65,000
OptiMetrics Subcontract Sensors Directorate (AFRL/RY)		
AFRL (PI) Sponsor/subcontract: UTC for WPAFRL project	5/1/10–1/30/11	$48,500
Biochemical Research and Development for Enhanced Device Fabrication and Processability of Biopolymer Materials		
AFOSR (Co-PI, PI Dalton,)	9/2009–8/2012	$540,000
Nano-engineering of Polymer and Dendrimer Materials for Emerging Defense Technologies		
AFOSR (Co-PI, PI Dalton)	12/2008–11/2014	$1,000,000
Nano-engineering of Active Metamaterials		
NSF (Co-PI, PI Dalton)	02/2009–12/2012	$390,000
Multi-Scale Theory Guided Development of Transformative Polymeric and Dendritic Electroactive Materials		
NIH Shared Instrumentation (PI Robinson)	5/2007-4/2009	$1,020,000
EleXys 580 EPR pulsed spectrometer		
NIH-RO1 (PI Robinson)	8/2002-7/2008	$175,000 (direct cost/yr)
Site Directed Spin Labeling of Interfacial Membrane Proteins		($1.3M total)
NSF Science and Technology Center (Co-Dir., Dir. Dalton)	8/2002–7/2011	$280,000 (BR annual)
Materials and Devices for Information Technology Research		($4.4M annual total)
NIH-Supplement (PI Robinson)	8/2005–7/2007	$75,000
Site Directed Spin Labeling of Interfacial Membrane Proteins	Postdoc. Supp. NCE to 7/2008	($1.3M total)

VII. Honors and Awards: None

VIII. Additional Comments on Research, Teaching, and Service:

I have been a contributor to the MDITR/STC that is centered in Chemistry. In that effort my group was challenged to quantitatively predict from first principles the electrooptic response of organic nonlinear optical materials. This had never been done before, and we succeeded by combining quantum mechanical calculations with statistical mechanical modeling. This was a classic example of multiscale modeling. We submitted a proposal to the Army research laboratories to extend our efforts to predict the electronic properties of organic and other "over-the-horizon" electronic devices. We did not win that award (only one will be given) but crafting the proposal was a great pleasure for me, working with wonderful colleagues in Chemistry and in the College of Engineering.

In my thirty years here I have had the privilege to publish with twelve other colleagues in the Department. I enjoy teaching and can be called upon to do many courses in the Department; I have developed a new course every year for eight out of ten the last years.

Summary of Selected Professional Activities

Name: Tomikazu Sasaki — Date of Revised Vitae: June 2011
Rank: Professor — Date of Ph.D.: **1985** — Date of UW hire: **1989** — Date of last promotion: **2009**

I. *Courses Taught*:

CHEM 220 (2)
CHEM 237 (3)
CHEM 238 (10)
CHEM 239 (15)
CHEM 242 (2)
CHEM 336 (2)
CHEM 399
CHEM 437 (1)
CHEM 460 (15)
CHEM 462 (5)
CHEM 463 (12)
CHEM 499
CHEM 531 (3)
CHEM 532 (3)
CHEM 600
CHEM 800

II. Department and University Service:

Departmental Committees:

Safety Committee (1992-2003)
Departmental 10-year Review Committee (1998)
Graduate Admission and Good Standing Committee (2003-2008)
200-Level Lab Committee (Chair) (2003-2007)
Organic Faculty Search (2007-2010)

College and University Committees:

Faculty Senate (2003-2005)
Faculty Search Committee, College of Forest Resources (2005)

15 Total Other Graduate Supervisory Committees: (does not include students in own group)

III. Research Group (current):

2 graduate students
1 undergraduate students
1 postdoctorals
1 other Visiting Faculty
6 Ph.D.s granted career total

IV. Invited Lectures: career total 43

2002
"Peptide Templates, from Surface Modification to Glycopeptides" University of California-San Diego, October

2003
"Glycohelices as a Model System for Glycosphingolipid Microdomain" 3rd Self-Assembling Peptide Meeting, Crete, Greece, August

2004
"Anticancer Properties of Artemisinin-tagged Holotransferrin", Nippon Shinyaku, Japan, September.

2005
"Anti-cancer Activity of Artemisinin and its Derivatives", Omeros, August

2006
"Synthesis and Biological Activity of Artemisinin-tagged Transferrin", Artemisinin Meeting, Beijing, China, August
"Anti-tumor Activity of Artemisinin and Its Conjugates", Ajinomoto, Japan, August

2007
"Anti-tumor Activity of Artemisinin and Its Transferrin and Peptide Conjugates" Georgia State University, March

2008
"Anti-tumor activity of Artemisinin Derivatives" National Cancer Center, Tokyo, Japan, March

2009
"Anti-cancer Activity of Artemisinin and Its Conjugates with Iron Transport Molecules" 2nd Annual World Cancer Congress, Beijing, China, June. Co-organizer and Chair for a session "Novel Anti-cancer Drug Discovery - Artemisinin"

"Anti-cancer activity of Artemisinin Conjugates" International R&D Mission to Chongqing, Chongqing, China, October

2010

"Artemisinin and its Anti-cancer Activity" 1st Life Science Discovery Fund Meeting, Seattle, WA, April. I was the organizer of the meeting.

2011

"Artemisinin and its Anti-cancer Activity" 1st Life Science Discovery Fund Meeting, Seattle, WA, May. I was the organizer of the meeting.

V. Publications: career total [50] in press [ ] submitted [ ] book chapters, reviews [1]

Recent publications *(most important in bold)*

1. Sasaki, T., Findeis, M. A. and Kaiser, E. T. "Evaluation of the oxime resin based segment synthesis-condensation approach using RNase T1 as a model synthetic target." *J. Org. Chem.*, 56, 3159-68 (1991).

2. Ruan, F., Chen, Y., Itoh, K., Sasaki, T. and Hopkins, P. B. "Synthesis of peptides containing unnatural, metal-ligating residues: aminodiacetic acid as a peptide side chain." *J. Org. Chem*, 56, 4347-54 (1991).

3. **Lieberman, M. and Sasaki, T. "Iron(II) organizes a synthetic peptide into three-helix bundles." *J. Am. Chem. Soc.*, 113, 1470-1 (1991).**

4. Zheng, M., et al. "Regulatory role of GM3 ganglioside in a5b1 integrin receptor for fibronectin-mediated adhesion of FUA169 cells." *J. Biol. Chem.*, 268, 2217-22 (1993).

5. **Tabet, M., Labroo, V., Sheppard, P. and Sasaki, T. "Spermine-induced conformational changes of a synthetic peptide." *J. Am. Chem. Soc*, 115, 3866-8 (1993).**

6. Sasaki, T. and Lieberman, M. "Between the secondary structure and the tertiary structure falls the globule: a problem in de novo protein design." *Tetrahedron*, 49, 3677-89 (1993).

7. Inufusa, H., et al. "Enhanced inhibitory effect of polymeric star burst formed YIGSR peptide on newly established nude mouse spontaneous adenocarcinoma metastatic model." *International J. Oncol.*, 3, 957-62 (1993).

8. Tahmassebi, D. C. and Sasaki, T. "Synthesis of a New Trialdehyde Template for Molecular Imprinting." *J. Org. Chem.*, 59, 679-81 (1994).

9. Sasaki, T. and Sakai, S. "De novo design of peptide secondary structures and their functions." *Yuki Gosei Kagaku Kyokaishi*, 52, 381-91 (1994).

10. **Sakai, S. and Sasaki, T. "Multivalent Carbohydrate Ligands Assembled on a Metal Template." *J. Am. Chem. Soc*, 116, 1587-8 (1994).**

11. **Lieberman, M., Tabet, M. and Sasaki, T. "Dynamic Structure and Potential Energy Surface of a Three-Helix Bundle Protein." *J. Am. Chem. Soc*, 116, 5035-44 (1994).**

12. Hwang, K.-O., Yakura, Y., Ohuchi, F. S. and Sasaki, T. "Template-assisted assembly of metal binding sites on a silica surface." *Materials Science & Engineering, C: Biomimetic Materials, Sensors and Systems*, C3, 137-41 (1995).

13. Sakai, S., Shigemasa, Y. and Sasaki, T. "A self-adjusting carbohydrate ligand for GalNAc specific lectins." *Tetrahedron Letters*, 38, 8145-8148 (1997).

14. Geier, G. R., III and Sasaki, T. "The design, synthesis and characterization of a porphyrin-peptide conjugate." *Tetrahedron Letters*, 38, 3821-3824 (1997).

15. Tahmassebi, D. C. and Sasaki, T. "Synthesis of a Three-Helix Bundle Protein by Reductive Amination." *J. Org. Chem.*, 63, 728-731 (1998).

16. Hwang, K.-O. and Sasaki, T. "Imprinting for the assembly of artificial receptors on a silica surface." *Journal of Materials Chemistry*, 8, 2153-2156 (1998).

17. Sakai, S., Shigemasa, Y. and Sasaki, T. "Iron(II)-assisted assembly of trivalent GalNAc clusters and their interactions with GalNAc-specific lectins." *Bulletin of the Chemical Society of Japan*, 72, 1313-1319 (1999).

18. Geier, G. R., III and Sasaki, T. "Catalytic oxidation of alkenes with a surface-bound metalloporphyrin-peptide conjugate." *Tetrahedron*, 55, 1859-1870 (1999)

19. Boeckl, M. S., Bramblett, A. L, Hauch, K. D., Sasaki, T., Ratner, B. D., Rogers, Jr., J. W. "Self-Assembly of Tetraphenylporphyrin Monolayers on Gold Substrates." *Langmuir*, 16, 5644-5653 (2000)

20. Nelson, K. E., Gamble, L., Jung, L. S., Boeckl, M. S., Naeemi, E., Golledge, S. L., Sasaki, T., Castner, D. G., Campbell, C. T., Stayton, P. S. "Surface Characterization of Mixed Self-Assembled Monolayers Designed for Streptavidin Immobilization." *Langmuir*, 17, 2807-2816 (2001).

21. Arai, T., Inudo, M., Ishimatsu, T., Sasaki, T., Kato, T., Nishino, N. "CD investigation of porphyrin-porphyrin interaction with links to acyclic b-sheet peptide self-assembled in an aqueous media." *Chemistry Letters*, 1240-1241 (2001).

22. Baas, T.; Gamble, L.; Hauch, K. D.; Castner, D. G.; Sasaki, T., *"Characterization of a Cysteine-Containing Peptide Tether Immobilized onto a Gold Surface" Langmuir*. **18** 4898 (2002)

23. Bramblett, A. L.; Boeckl, M. S.; Hauch, K. D.; Ratner, B. D.; Sasaki, T.; Rogers, J. W., Jr., "Determination of surface coverage for tetraphenylporphyrin monolayers using ultraviolet visible absorption and x-ray photoelectron spectroscopies" *Surface and Interface Analysis*. 506 (2002).

24. T. Hasegawa, T. Sasaki "Glyco-helix as a Model System for Glycosphingolipid Microdomain" *Chem Commun* 978 (2003).

25. Arai, T.; Inudo, M.; Ishimatsu, T.; Akamatsu, C.; Tokusaki, Y.; Sasaki, T.; Nishino, N. "Self-Assembling of the Porphyrin-Linked Acyclic Penta- and Heptapeptides in Aqueous Trifluoroethanol" *J. Org. Chem*. **68** 5540 (2003).

26. Halter, M.; Nogata, Y.; Dannenberger, O.; Sasaki, T.; Vogel, V. "Engineered Lipids That Cross-Link the Inner and Outer Leaflets of Lipid Bilayers" *Langmuir* **20**, 2416 (2004)

27. Lai, H., Sasaki, T., Singh Narendra, P. and Massey, A. "Effects of artemisinin-tagged holotransferrin on cancer cells." *Life Sciences,* 76, 1267-79 (2005).

28. Kim, B. J. & Sasaki, T. Recent Progress in the Synthesis of Artemisinin and its Derivatives. Organic Preparations and Procedures 38, 1 – 80 (2006).

29. Jones, Jace W.; Sasaki, Tomikazu; Goodlett, David R.; Turecek, Frantisek " Electron Capture in Spin-Trap Capped Peptides. An Experimental Example of Ergodic Dissociation in Peptide Cation-Radicals" *J. Am. Soc. Mass Spec*. 18(3), 432-444 (2007).

30. Nakase, I., Lai, H., Singh, N. P. & Sasaki, T. Anticancer Properties of Artemisinin Derivatives and Their Targeted Delivery by Transferrin Conjugation. Int. J. Pharm. 354, 28-33 (2007)

31. Oh, S., Kim, B.J., Singh N. P., Lai, H. & Sasaki, T. Synthesis and Anti-cancer Activity of Covalent Conjugates of Artemisinin and a Transferrin-receptor Targeting Peptide. Cancer Lett. 272, 110-121 (2008)

32. Nakase, I., Gallis, B., Takatani-Nakase, T., Oh, S., Lacoste E., Singh, N.P., Goodlet, D.R., Tanaka, S., Futaki, S., Lai, H. and Sasaki, T. Transferrin receptor-dependent cytotoxicity of artemisinin-transferrin conjugates on prostate cancer cells and induction of apoptosis. Cancer Letters 274, 290-298 (2009)

33. Lai, H. Nakase, I., Lacoste, E., Singh, N. P., and Sasaki, T. "Artemisinin-Transferrin Conjugate Retards Growth of Breast Tumors in the Rat" Anticancer Res. 29, 3807-3810 (2009).

34. Morrissey, C., Gallis, B., Solazzi, JW, Kim, BJ, Gulati, R., Vakar-Lopez, F., Goodlett, R.R., Vessella, R.L., and Sasaki, T. Effect of artemisinin derivatives on apoptosis and cell cycle in prostate cancer cells. Anti-Cancer Drugs, 21, 423-432 (2010).

35. Ferreira, J. F. S., Luthria, D. L., Sasaki, T., and Heyerick, A. "Flavonoids from Artemisia annua L. as Antioxidants and Their Potential Synergism with Artemisinin against Malaria and Cancer" Molecules 15, 3135-3170 (2010).

Patents

1. Labroo, Virender; Sasaki, Tomikazu. Preparation of derivatized calcitonins for reducing serum calcium. (Zymogenetics, Inc., USA; University of Washington). PCT Int. Appl. (1994), 43 pp. CODEN: PIXXD2 WO 9415962 A2 19940721. Application: WO 93-US12692 19931230. Priority: US 92-999749 19921231. CAN 122:240450 AN 1995:315610 CAPLUS.

2. Labroo, Virender M.; Sasaki, Tomikazu. Preparation of derivatized calcitonins. (Zymogenetics, Inc., USA; University of Washington). PCT Int. Appl. (1995), 46 pp. CODEN: PIXXD2 WO 9518152 A1 19950706 Application: WO 94-US14303 19941214. Priority: US 93-176153 19931230. CAN 124:9465 AN 1995:957977 CAPLUS.
3. Labroo, Virender M.; Sasaki, Tomikazu. Preparation of derivatized calcitonins for reducing serum calcium. (USA). U.S. (1998), 13 pp., Cont.-in-part of U.S. Ser. No. 999,749, abandoned. Application: US 93-176153 19931230.
4. Sasaki, T., Lai, H., Singh, NP., Covalent Conjugates Between Endoperoxides and Transferrin and Lactoferrin Receptor-Binding Agents, PCT/US2007/081433, 3/28/07
5. Sasaki, T., Lai, H., Singh, NP., Conjugates of Artemisinin-Related Endoperoxides and Hydrazone Derivatives for the Treatment of Cancer, PCT/US2007/65399, 10/15/07 - issued.

Invention Disclosures

A total of 26 invention disclosures have been filed with the University of Washington Center for Commercialization.

VI. Grant Activity:

Current:

1. Life Science Discovery Fund (PI) with Henry Lai, Narendra Singh, Dave Goodlett and Byron Gallis, "Develeopment of Artemisinin Compounds for Cancer Treatment", 3/11/10 - 8/31/13, $616,284 (Sasaki's portion).
2. National Institutes of Health (R01-ES016873), 3/1/10-2/28/13, $6,812 (Sasaki). PI: J. Zhang (UW Pathology); "*Microglial Phox Activity in Parkinson's Disease"*
3. Holley Pharmaceutical (PI), 2/1/10 - 1/31/11, $102,723
4. Royalty Research Fund (co-PI) with Colm Morrissey, "Evaluation of Anti-cancer Activity of an Artemisinin Derivative in a Prostate Cancer Xenograft Model" 6/1/11 - 5/31/12, $38,473
5. Capita Foundation Auditory Research Grant (Collaborator) " Use of fluorescently-conjugated cisplatin to study the uptake of cisplatin into hair cells" 2/1/11 - 1/31/12, $10,000
6. NIH Administrative Supplement program for Bastyr/ University of Washington Oncomycology Research Center (U19 AT6028) (Collaborator) "Analyzing the Structure Activity Relationship in Different Mushroom Extracts Using TLR2 Agonist Activity Assay and NMR Analysis" 6/1/11 - 5/31/12, $100,000.

*Pending***:**

1. Institute of Translational Health Sciences (PI) "Initial Pharmacokinetics and Tissue Distribution Studies of Artemisinin-nanoparticle Formulations" 7/1/11 - 6/30/12, $40,000.

Completed:

1. Akibene Foundation (PI) “Synthesis of fluorescence-tagged artemisinin”, 10/1/03 – 9/30/05, $66,000.
2. Holley Pharmaceuticals (PI) “Cancer cell cytotoxicity of artemisinin-tagged holotransferrin” 12/01/04 - 5/31/06, $240,559.
3. Susan Komen Foundation (co-PI) “Artemisinin and Artemisinin-tagged Holotransferrin for Treatment of Breast Cancer”, 5/01/05 – 4/31/07 $100,000 (Sasaki’s portion)
4. Washington Technology Center (PI) with Henry Lai and Narendra Singh " Preclinical Development of Artemisinin Trioxane Dimer-Peptide Conjugates as Targeted Cancer Therapeutics", 7/1/07 - 6/30/08, $100,000
5. Artemisia BioMedical (PI) with Henry Lai and Narendra Singh" Preclinical Development of Artemisinin Trioxane Dimer-Peptide Conjugates as Targeted Cancer Therapeutics", 7/1/07 - 6/30/08, $20,000
6. The Whitmer Foundation (PI) "Synthesis of Artemisinin Conjugates", 4/1/07 - 3/31/10 $5,000.

VII. Honors and Awards:

One of the top 10 inventors at the University of Washington (2006)

VIII. Additional Comments on Research, Teaching, and Service:

Summary of Selected Professional Activities

Name: **Robert E. Synovec** Date of Revised Vitae: **June 7, 2011**
Rank: **Professor** Date of PhD: **1986** Date of UW hire: **1986** Date of last promotion: **2001**

I. Courses Taught (2000-present):

CHEM 142 (3), CHEM 321 (15), CHEM 429 (10), CHEM 426 (1)
Comment: IAS teaching ratings (items 1-4, average of years above): **4.0** for CHEM 429 (Chemical Separation Techniques), **3.7** for CHEM 321 (Quantitative Analysis with Lab), and **3.7** CHEM 142 (General Chemistry). Also, CHEM 199, 399, 499, 590, 592 several times; CHEM 600, 700, 800 throughout.

II. Department and University Service (2000 – present):

Departmental Committees: Associate Chair for Graduate Education (2007-present); Chair Advisory (2007-present); Graduate Education Admissions (2000-present); Analytical or Other Faculty Searches (2000-present), Undergraduate Education (Lab Renovation 2000-2003; 300-400 Level Labs, Chair, 2001-2005; Entry-Level Lab/Lecture 2003-present); Instructional Coordinator (Analytical) 2006-present.

College and University Committees: UW Faculty Senate (2003-05); Commencement College Marshal (1999-2004); Mary Gates Endowment Fellowship Review (2002-03); Center for Process Analytical Chemistry (CPAC) Policy Board (2004-07). CPAC Faculty Director (2007-11); Graduate School Council Nomination Committee (2008).

136 Graduate Supervisory Committees (**18** current), with **21** as the Graduate School Representative (GSR). Also, of the 136, I have served on a total of **57 UW** PhD dissertation reading committees. **Note:** Does not include **32** PhDs granted to students from my group, and **3** thesis MSs from my group, plus **10** external PhD dissertation reading committees: Chiang Mai Univ., Thailand (2004, 2004); RMIT Univ., Australia (2000); Univ. Degli Studi Di Pisa, Italy (2002, 2002); University of Alberta, Canada (2000, 2007); Univ. of Waterloo, ON, Canada (2004); Univ. of New South Wales, Australia (2007, 2010).

III. Research Group (current):

7 Graduate Students **3** Postdoctoral Associates **32** PhDs granted (career total)
1 Current Undergrads, **37** total **40** total Visiting: Scientists, **29**; Faculty, **11**

IV. Invited Lectures: career total **181**

Selected Invited Lectures pre-2000 in chronological order:
SUNY-Buffalo, NY; Univ. of Arizona, Tucson, AZ; Univ. of Texas, Austin, TX; Texas A&M Univ., College Station, TX; 194th ACS Nat'l Mtg., New Orleans, LA; 2nd Int'l Forum for Process Analytical Chem. (IFPAC), Chicago, IL (2 lectures); JANNAF Conf. on Fuels & High Speed Flight Vehicles, Woods Hole, MA; APS ILS Conf., Atlanta, GA; Perkin-Elmer Corp., Norwalk, CT; SPIE Conf. on Chemical, Biochemical & Environmental Sensors, Boston, MA; Union Carbide, South Charleston, WV; 4th IFPAC, Houston, TX (2 lectures); 14th Int'l Symp. on Liquid Chromatography, Boston, MA; Cargill Research, Wayzata, MN; 21st Ohio Valley Chromatography Symp., Hueston Woods Lodge, OH; Wright-Patterson AFB (USAF), Dayton, OH; Gordon Research Conf. on Analytical Chem., New Hampton, NH; Texas Tech Univ., Lubbock, TX; FACSS, Cleveland, OH; Washington State Univ., Pullman, WA; SOQUE 13th Int'l Conf. on Lasers & Applications, San Diego, CA; SPIE Conf. on Optical Methods for Ultrasensitive Detection & Analysis, Los Angeles, CA; SPIE Conf. on Environmental Sensing & Combustion Diagnostics, Los Angeles, CA; 201st ACS Nat'l Mtg., Atlanta, GA; Shanghai Inst. of Metallurgy, Shanghai, China; Hunan Univ., Changsha, China; Union Carbide, South Charleston, WV; Exxon, Florham Park, NJ; Cargill, Sidney, OH; Wright-Patterson AFB, Dayton, OH; 206th ACS Nat'l Mtg., Chicago, IL; 207th ACS Nat'l Mtg., San Diego, CA; 18th Int'l Symp. on Liquid Chromatography, Minneapolis, MN; SPIE Conf. on Chemical, Biochemical, & Environmental Fiber Sensors, San Diego, CA; Univ. of Cincinnati, Cincinnati, OH; Applied Automation, Bartlesville, OK; Western Biotech Conf., San Diego, CA; Univ. of Idaho, Moscow, ID; Boeing, Seattle, WA; ACS Boulder Dam Section, Las Vegas, NV; E. I. DuPont Co., Wilmington, DE; 11th IFPAC, Blaine, WA; 19th Int'l Symp. in Capillary Chromatography & Electrophoresis (ISCCE), Wintergreen, VA; Dow Chemical Corp., Freeport, TX; 12th IFPAC, Orlando, FL; 29th Ohio Valley Chromatography Symp., Hueston Woods Lodge, OH; 13th IFPAC, San Antonio, TX; 50th Pittsburgh Conf. (PittCon), Orlando, FL; 21st ISCCE, Park City, UT; Chiang Mai Univ., Chiang Mai, Thailand (2 lectures); Mahidol Univ., Bangkok, Thailand (2 lectures); Akzo Nobel, Dobbs Ferry, NY; Univ. of Arkansas, Fayetteville, AR; FACSS, Vancouver, BC, Canada.

Selected invited lectures since 2000:

2000: Texas Tech Univ., Lubbock, TX; U. of Alberta, Edmonton, Canada; U. of New Mexico, Albuquerque, NM; 83rd Canadian Soc. for Chem. Conf., Calgary, AB, Canada; 24th Int'l Symp. High Performance Liq. Phase Sep. (HPLC 2000), Seattle, WA; Gordon Research Conf. - Bioanalytical Sensors, Proctor Academy, NH; Bristol-Myers Squibb, New Brunswick, NJ; 4th Int'l Conf. on Environmetrics and Chemometrics, Las Vegas, NV; Ashland Chemical Co., Dublin, OH; Molecular Dynamics, Sunnyvale, CA (2 lectures).

2001: Arizona St. Univ. (SWAP 2001), Tempe, AZ; NDSU, Fargo, ND; UND, Grand Forks, ND; 221st Nat. ACS, San Diego, CA ; 24th ISCCE, Las Vegas, NV.

2002: 7th Int'l Symp. on Hyph. Tech. in Chromatogr. (HTC-7), Bruges, Belgium (lecture and 6 hour invited short course); 85th Canadian Soc. for Chem. Conf., Vancouver, BC, Canada; 8th Int'l Conf. on Chemometrics in Anal. Chem. (CAC-2002), Seattle WA; USAF, Patrick AFB, Cape Canaveral, FL.

2003: 16th Int'l Symp. on Microscale Separations and Analysis (HPCE 2003), San Diego, CA; 1st Int'l Symp. Comprehensive Multidimensional GC, Volendam, Netherlands, 26th ISCCE, Las Vegas, NV; LECO Corporation, St. Joseph, MI (2 lectures); Dow Chemical, Freeport TX; Gulf Coast Conf., Galveston, TX.

2004: 8th Int'l Symp. on Hyph. Tech. in Chromatogr. (HTC-8), Bruges, Belgium; 17th Int'l Symp. on Microscale Separations and Analysis (HPCE 2004), Salzburg, Austria; DOD Technology Program Review, Aberdeen Proving Ground, Edgewood, MD; 2nd Int'l Symp. on Comprehensive Multidimensional GC, Atlanta, GA; Univ. of Montana, Missoula, MT.

2005: 19th IFPAC, Arlington, VA; Colorado State U. (SWAP 2005), Fort Collins, CO; DOD Technology Program Review, MRI, Palm Bay, FL; PittCon, Orlando, FL; Minnesota Chromatography Forum, Minneapolis, MN; 28th ISCCE, Las Vegas, NV; 79th ACS Colloids Surface Science, Clarkson U., Potsdam, NY; 32nd FACSS and 51st ICASS, Quebec City, Canada; Chico State U., Chico, CA; LECO Corp., St. Joseph, MI.

2006: DOD Technology Program Review, ENSCO, Melbourne, FL; PittCon, Orlando, FL; Florida State U., Tallahassee, FL; ExxonMobil, Corporate Strategic Research Lab., Clinton, NJ; Minnesota Chromatography Forum, Nye's Polonaise, Minneapolis, MN; Fort Lewis College, Durango, CO; U. South Florida, Tampa, FL.

2007: 4th Int'l Symp. Austrian Proteomics Platform, Seefeld, Austria; U. of Regensburg Medical School, Regensburg, Germany; 4th Int'l Symp. on GC x GC, Dalian, China; U. of Alberta, Edmonton, Alberta, Canada; 31st ISCCE, Albuquerque, NM.

2008: Boeing, Seattle, WA; HTC-10, Bruges, Belgium; PittCon, New Orleans, LA; Purdue Univ., Bindley Bioscience Ctr, West Lafayette, IN; HPLC 2008, Baltimore, MD; Iowa State Univ., Ames, IA; 5th GCxGC & 32nd ISCCE, Riva del Garda, Italy; PNNL, Richland, WA; Siena Conf. on Product & Process Optimization, Siena, Italy; Inst. per i Processi Chimico-Fisici, Pisa, Italy; Bethel Univ., Arden Hills, MN; Univ. of St. Thomas, St. Paul, MN.

2009: Association for Lab Automation (ALA09), Palm Springs, CA; PittCon, Chicago, IL; Weyerhaueser Technology Center, Federal Way, WA; 6th GC x GC and 33rd ISCCE, Portland, OR (lecture and short course) SRI, Int'l, Menlo Park, CA; Kidney Research Inst., Seattle, WA; Idaho State U., Pocatello, ID; Oregon State U., Corvallis, OR; PNNL, Richland, WA.

2010: Assn. for Lab Automation (ALA10), Palm Springs, CA; 24th Int'l Forum for Process Analytical Chemistry, Baltimore, MD (2 lectures); 7th GC x GC and 34th ISCCE, Riva del Garda, Italy; U.S. Army Research Laboratory, Adelphi, MD; Sandia National Lab., Albuquerque, NM; PNNL, Richland, WA; 2010 Pacifichem, Honolulu, HI.

2011: 8th GC x GC and 35th ISCCE, San Diego, CA (lecture and short course)

V. Publications: career total **192** in press **2** submitted **2** book chapters, reviews **18**

Selected publications, with citations in [ ] for the top 10 in terms of citations/year:

1. "Quantitative Analysis Without Analyte Identification by Refractive Index Detection," R.E. Synovec and E.S. Yeung, *Anal. Chem.*, 1983, **54**, 1599-1603.
10. "Detectors for Liquid Chromatography," E.S. Yeung and R.E. Synovec, *Anal. Chem.*, 1986, **58**, 1237A-1256A. **Invited, peer reviewed A-page article.**
13. "Refractive Index Effects in Cylindrical Detector Cell Designs for Microbore High Performance Liquid Chromatography," R.E. Synovec, *Anal. Chem.*, 1987, **59**, 2877-2884.
40. "Effect of Temperature on Separation Efficiency for High-Speed Size Exclusion Chromatography," C.N. Renn and R.E. Synovec, *Anal. Chem.*, 1992, **64**, 479-484.
59. "Fiber Optic-Based Mode-Filtered Light Detection for Small Volume Chemical Analysis," R.E. Synovec, A.W. Sulya, L.W. Burgess, M.D. Foster and C.A. Bruckner, *Anal. Chem.*, 1995, **67**, 473-481.
60. "Correlation of Quantitative Analysis Precision to Retention Time Precision and Chromatographic Resolution for Rapid, Short-Column Analysis," T.J. Bahowick and R.E. Synovec, *Anal. Chem.*, 1995, **67**, 631-640.

65. "Dissolution Behavior and Surface Tension Effects of Organic Compounds in Nucleating Cloud Droplets," M. L. Schulman, M. C. Jacobson, R. J. Charlson, R. E. Synovec and T. E. Young, *Geophysical Research Letters*, 1996, **23**, 277-280. **[234 citations]**
66. "Reversed Phase Liquid Chromatography of Organic Hydrocarbons with Water as the Mobile Phase," M. D. Foster and R. E. Synovec, *Anal. Chem.*, 1996, **68**, 2838-2844.
72. "Standardization of Second Order Chromatographic/Spectroscopic Data for Optimum Chemical Analysis," B. J. Prazen, R. E. Synovec and B. R. Kowalski, *Anal. Chem.*, 1998, **70**, 218-225. **[84 citations]**
76. "Comprehensive Two-Dimensional High Speed Gas Chromatography with Chemometric Analysis," C. A. Bruckner, B. J. Prazen and R. E. Synovec, *Anal. Chem.*, 1998, **70**, 2796-2804. **[130 citations]**
92. "Comprehensive Two-Dimensional Gas Chromatography and Chemometrics for the High-Speed Quantitative Analysis of Aromatic Isomers in Jet Fuel Using the Standard Addition Method and an Objective Retention Time Alignment Algorithm," C. G. Fraga, B. J. Prazen and R. E. Synovec, *Anal. Chem.*, 2000, **72**, 4154-4162. **[76 citations]**
104. "Pattern Recognition of Jet Fuels: Comprehensive GC x GC with ANOVA-Based Feature Selection and Principal Component Analysis," K. J. Johnson and R. E. Synovec, *J. Chemom. Intell. Lab. Syst.*, 2002, **60**, 225-237. **[58 citations]**
111. "Chemometric Analysis of Comprehensive Two-Dimensional Separations," R. E. Synovec, B. J. Prazen, K. J. Johnson, C. G. Fraga and C. A. Bruckner, in *Advances in Chromatography* (P. R. Brown and E. Grushka, eds.), Marcel Dekker, Inc., New York, 2003, **Volume 42**, pp. 1 - 42. **Invited, peer reviewed book chapter.**
116. "High-Speed Peak Matching Algorithm for Retention Time Alignment of Gas Chromatographic Data for Chemometric Analysis," K. J. Johnson, B. W. Wright, K. H. Jarman and R. E. Synovec, *J. Chromatogr. A*, 2003, **996**, 141-155. **[73 citations]**
117. "Monolayer-Protected Gold Nanoparticles as a Stationary Phase for Open Tubular GC," G. M. Gross, D. A. Nelson, J. W. Grate and R. E. Synovec, *Anal. Chem.*, 2003, **75**, 4558-4564.
129. "Theoretical Modeling and Experimental Evaluation of a Microscale-Molecular Mass Sensor," C. D. Costin, A. D. McBrady, M. E. McDonnell and R. E. Synovec, *Anal. Chem.*, 2004, **76**, 2725-2733.
130. "High-Speed GC using Synchronized Dual-Valve Injection," G. M. Gross, B. J. Prazen, J. W. Grate and R. E. Synovec, *Anal. Chem.*, 2004, **76**, 3517-3524.
137. "Algorithm for Locating Analytes of Interest based on Mass Spectral Similarity in GC x GC-TOFMS Data: Analysis of Metabolites in Human Infant Urine,"A. E. Sinha, J. L. Hope, B. J. Prazen, E. J. Nilsson, R. M. Jack and R. E. Synovec, *J. Chromatogr. A*, 2004, **1058**, 209-215. **[44 citations]**
138. "High Throughput Screening of Protein Surface Activity via Flow Injection Analysis – pH Gradient – Dynamic Surface Tension Detection," B. A. Staggemeier, E. Bramanti, C. Allegrini, K. J. Skogerboe and R. E. Synovec, *Anal. Chem.*, 2005, **77**, 250-258.
150. "Comprehensive Two-Dimensional Gas Chromatography Time-of-Flight Mass Spectrometry Analysis of Metabolites in Fermenting and Respiring Yeast Cells," R. E. Mohler, K. M. Dombek, J. C. Hoggard, E. T. Young and R. E. Synovec, *Anal. Chem.*, 2006, **78**, 2700-2709. **[53 citations]**
154. "Classification of High Speed GC-MS Data by PCA Coupled with Piecewise Alignment and Feature Selection," N. E. Watson, M. M. VanWingerden, K. M. Pierce, B. W. Wright and R. E. Synovec, *J. Chromatogr. A*, 2006, **1129**, 111-118.
161. "Comprehensive Three-Dimensional Gas Chromatography with Parallel Factor Analysis," N. E. Watson, W. C. Siegler, J. C. Hoggard and R. E. Synovec, *Anal. Chem.*, 2007, **79**, 8270-8280.
164. "Cyclic Changes in Metabolic State During the Life of a Yeast Cell," B. P. Tu, R. E. Mohler, K. M. Dombek, E. T. Young R. E. Synovec and S. L. McKnight, *PNAS*, 2007, **104**, 16886-16891. **[39 citations]**
166. "Recent Advancements in Comprehensive Two-Dimensional Separations with Chemometrics," K. M. Pierce, J. C. Hoggard, R. E. Mohler and R. E. Synovec, *J. Chromatogr. A*, 2008, **1184**, 341-352. **Invited, peer-reviewed Review. [47 citations]**
170. "Automated Resolution of Non-Target Analyte Signals in GC x GC-TOFMS Data using Parallel Factor Analysis (PARAFAC)," J. C. Hoggard and R. E. Synovec, *Anal. Chem.*, 2008, **80**, 6677-6688.
172. "Time-Dependent Profiling of Metabolites from Snf1 Mutant and Wild Type Yeast Cells," E. M. Humston, K. M. Dombek, J. C. Hoggard, E. T. Young and R. E. Synovec, *Anal. Chem.*, 2008, **80**, 8002-8011.
184. "Utilizing the Third Order Advantage with Isotope Dilution Mass Spectrometry," E. M. Humston, J. C. Hoggard and R. E. Synovec, *Anal. Chem.*, 2010, **82**, 41-43. **Invited Letter**

Comments: 62 total in *Analytical Chemistry*, and **36** total in *Journal of Chromatography A*. Also, over **470** combined invited lectures, and contributed talks and posters. Total citations (ISI Web of Knowledge) is **3,137**.

VI. Grant Activity (2000-present):

Funded (active): (PI unless otherwise noted)		
DOE (Co-PI w/ M. Lidstrom (PI)) *Metabolomics – AM1 Integration*	7/11-6/14	$234,120 (Chem)
PNNL-DOE *Pattern Recognition and Classification of Fuels using GG Data*	12/98-9/11	$740,328
Honeywell (DARPA-SRI) *Panoptic Analysis of Trace Chemicals (PACT) Program*	8/10-3/12 (Phase 2)	$172,002
PNNL-DOE *Chemometric Analysis of GC x GC – TOFMS Data*	10/10-9/11	$37,986
NIH (Co-PI w/ R. Tian (PI)) *Mitochondria and Metabolism*	9/09-8/11	$143,061 (Chem)
USAF *Kerosene Fuel Characterization*	1/10-9/11	$56,657
CPAC *Process Liquid Chromatography*	10/95-9/11	$372,473
CPAC *Process Gas Chromatography and Chemometrics*	10/95-9/11	$490,923
Ashland and ChevronTexaco *Synovec Research Program*	7/05-12/19	$70,000 (direct)
Submitted proposals:		
ARL/ARO (DOD) *GC x GC – TOFMS for Metabolomics*	1/12-12/14	$202,882
PNNL-DOE *Pattern Recognition and Classification of Fuels using GG Data*	9/11-9/12 in prep	$63,000
PNNL-DOE *Chemometric Analysis of GC x GC – TOFMS Data*	1/12-12/12 in prep	$40,000
Funded (complete):		
NIH (Co-PI w/ M. Lidstrom (PI)) *Metabolomics – AM1 Integration*	2/09-1/11	$150,471 (Chem)
CPAC (Faculty Director) *Center for Process Analytical Chemistry*	2007-11	$1,986,537
Honeywell (DARPA-SRI) *Panoptic Analysis of Trace Chemicals (PACT) Program*	7/09-2/10 (Phase 1)	$174,625
ASTM Committee-CRC *Development of an Advanced Test Method for Jet Fuel*	6/09-6/10 (Phase 1)	$30,000
WTC-RTD *Magic Bean: Point Detection Chemical Analysis System for Cacoa Beans*	1/09-12/09	$33,870 (direct)
PNNL-DOE *Trace Impurity Profiling of Chemical Products Using GC Data*	1/09-6/09	$25,815
M. J. Murdock Charitable Trust, Partners in Science Award *Metabolomics Study*	2007-08	$15,000 (direct)
LECO *Chemometrics for GC x GC-TOFMS*	8/04-12/08	$270,000
Honeywell/DARPA *Micro Gas Analyzer*	8/04-10/07	$338,585
LLNL/DOE *Micro Gas Analyzer with Single Wall Carbon Nanotubes*	1/07-6/07	$13,130
Kraft *Dynamic Surface Tension Analysis*	12/06-6/07	$15,000
DOD *GC x GC –TOFMS Software Development*	4/02-9/06	$655,000
ChevronTexaco *ChevronTexaco Synovec*	12/04-12/19	$20,000 (direct)
CPAC *On-Line Measurement of Interfacial Properties*	9/98-9/05	$189,671
PNNL-DOE *Equilibration Sensing*	9/03-12/04	$34,000
PNNL-DOE *Sensor Array Research*	7/00-9/03	$182,766
PNNL-DOE *GC x GC – FID Phosphorous Compounds*	7/01-9/01	$22,200
DOW Chemical Corp. *DOW Synovec*	3/01-12/19	$10,000 (direct)
NOAA (Co-PI w/ G. Van Blaricom (PI)) *GC x GC / Stellar Sea Lions Study*	9/01-9/04	$107,478 (Chem)
DOW Chemical Corp. *DOW-POST DOC*	6/01-5/02	$66,000
Idaho NEEL *GC x GC – IMS and Spectroscopic Sensing*	8/01-1/02	$35,000
NSF-STTR *GC x GC – MS Metabolites* (Co-PI w/ E. Nilsson (PI)	7/03-6/04	$30,000 (Chem)
JIN/UW-PNNL *Fundamental Studies of Gold Nanoparticles* (PI w/ J. Grate)	6/02-12/04	$80,224 (direct)

Comments: Several equipment donations since 2000, not listed above, have a value of approximately $150,000. Collaborations have led to funded projects and proposals, recently including Lidstrom (NIH, DOE), Tian (NIH), Honeywell/SRI, PNNL and the USAF. Collaborations with the ARL (DOD) look promising for future funding.

VII. Honors and Awards:

Assistant editor of *TALANTA* (since 1990), and editorial boards of *Journal of Chromatography A* (since 2003) and *Current Analytical Chemistry* (since 2004). 2000 Amersham Pharmacia Professor in Residence, Molecular Dynamics, Sunnyvale, CA. Recipient of the L. S. Palmer Award, at the Minnesota Chromatography Forum (May 2009). Appointed to the GC x GC International Symposium permanent scientific committee (2010).

VIII. Additional Comments on Research, Teaching, and Service:

My research program is focused on the following areas: (1) the analytical areas of metabolomics, forensics, and fundamental fuel studies using GC x GC-TOFMS and LC/MS-MS combined with chemometric software development and utilization, and (2) fundamental studies and developments in ultra high-speed gas chromatography for real-time gas phase sensing. I am significantly involved with leading our graduate program (interdisciplinary across campus, national, and international activities). I have served as the co-chair for the previous two international symposia for Capillary Chromatography (ISCC) in Portland (2009) and San Diego (2011).

Summary of Selected Professional Activities

Name: **František Tureček** Date of Revised Vitae: May 18, 2011
Rank: Professor Date of Ph.D.: **1977** Date of UW hire: **1990** Date of last promotion: **1995**

I. Courses Taught (only list course number & times taught, e.g. "CHEM 142 (12)"):

CHEM 162, CHEM 321, CHEM 520A, CHEM 522, CHEM 590, all multiple times.

II. Department and University Service:

Departmental Committees: Research Services, Chair, 1999-Present; Academic Personnel, 1996-Present; Chair's Advisory, 1995-Present; Analytical Division Coordinator 1992-2007t; Ad hoc and search committees (several)

College and University Committees: None

38 Total Other Graduate Supervisory Committees: (does not include students in own group)

III. Research Group (current):

7 graduate students	2 Postdoctoral associates	16 Ph.D.s granted (career total)
2 undergraduate students	2 other Visiting Faculty	

IV. Invited Lectures: career total over 150

Previous years *(selected)*:

1985: Keynote lectures at International Mass Spectrometry Conferences, Swansea, Wales.
1988: Keynote lectures at International Mass Spectrometry Conferences, Bordeaux, France.
1993: Keynote lecture at the Congress of French Society for Mass Spectrometry, Metz, France.
1996: Keynote lecture at the 7th Triennial Conference of the Indian Society for Mass Spectrometry, Gwalior, India;
2001: Plenary lecture at the Annual Conference of the Australia and New Zealand Societies for Mass Spectrometry, Golden Coast, Australia.
2003: Chemical Physics Colloquium, California Institute of Technology; Informal Meeting on Mass Spectrometry, Tokaj, Hungary.
2004: Plenary lecture at the Conference of the German Society for Mass Spectrometry, Rostock, Germany; Informal Meeting on Mass Spectrometry, Prague, Czech Republic.
2005: U. of Melbourne, U. of Wollongong, U. of Adelaide, U. of Sydney, U. of New South Wales, Monash U., La Trobe U., all Australia; Technion-the Israel Inst. of Technology, U. of Tel Aviv, Israel; Inst. of Organic Chemistry, Prague; J. Heyrovsky Inst. of Physical Chemistry, Prague; 53rd Annual Conf. on Mass Spectrometry and Allied Topics, San Antonio. Keynote lecture at the 11th Triennial Conference of the Indian Society for Mass Spectrometry, Munar, India.
2006: Hopkins Faculty Award Lec., UW; 54th ASMS Conf., Seattle; 17th Int'l Mass Spectrometry Conf., keynote, Prague; Charles U. Med. School; Plenary lecture at the 58th Congress of the Czech Chem. Soc., Usti nad Labem; La Sapienza, U. of Rome; Ecole Polytechnique, Palaiseau, France (4 lect); 13th Int'l Conf. on Newborn Screening, Yumebutai, Kobe; Kansai U., Osaka-Kansai; Japan Mass Spectrometry Mtg, Osaka; 4th UPPCON, Uppsala Conference on Electron Based Methods, Hong Kong.
2007: U. of the Pacific, Stockton, CA; York U., Toronto; 55th ASMS Conf., Indianapolis; Ion Storage Ring Workshop, Stockholm; U. of Aarhus, Denmark, 3 lectures; Universite Pierre et Marie Curie, Paris; Fudan U., Shanghai; Keynote lecture at the 35th CSI Conf., Xiamen, PRC; Keynote lecture at the 5th UPPCON, Uppsala Conference on Electron Based Methods, Paris.
2008: University of North Texas; University of Paris; University of Aarhus, Denmark; 6th UPPCON, Uppsala Conference on Electron Based Methods, Madison, WI.
2009: 57th ASMS Conference, Philadelphia,; Keynote lecture at the 17th International Mass Spectrometry Conference, Bremen, Germany, ISRIUM, International Symposium on Reactive Intermediates and Unusual Molecules, Liblice; Keynote lecture at the 7th UPPCON, Uppsala Conference on Electron Based Methods, Nara, Japan.
2010: University of Stockholm; Charles University, Prague; J. J. Marci Medal Plenary Lecture; Keynote lecture at the 58th ASMS Conference, Salt Lake City; Ecole Polytechnique, Palaiseau, France; Waters Corporation, Manchester; Summer School of Mass Spectrometry, Czech Republic; Palacky University, Czech Republic;

2011: American Society for Mass Spectrometry Sanibel Conference, St. Pete's Beach, FL; Plenary lecture at the 8th UPPCON, Uppsala Conference on Electron Based Methods, Villars, Switzerland; 59th ASMS, Conference, Denver, CO; Gordon Conference on Biomolecules in the Gas Phase; Plenary lecture at the 59th National Conference of the Japanese Society for Mass Spectrometry, Osaka, Japan; Keynote lecture at the 59th National Conference of the Japanese Society for Mass Spectrometry, Osaka, Japan; Plenary lecture at the Czech Society for Mass Spectrometry Conference, Hradec Kralove, Czech Republic.

V. Publications: career total 350 in press 2 submitted 3 book chapters, reviews 30

Selected publications:

1. Kočovský, P.; Tureček, F.; Hájíček, J. "*Synthesis of Natural Products. Problems of Stereoselectivity*." Vol. 1 and 2. CRC Press, Boca Raton, 1986.
2. McLafferty, F. W.; Tureček, F. "Interpretation of Mass Spectra", 4th Edition. University Science Books, Mill Valley, CA, 1993. ***Cited more than 2000 times***.
3. Splitter, J. S.; Tureček, F.; Eds. *Applications of Mass Spectrometry to Organic Stereochemistry*, VCH Publishers: New York, 1994.
4. Gu, M.; Tureček, F. "The Elusive Dimethylhydroxysulfuranyl Radical. An Intermediate or a Transition State?" *J. Am. Chem. Soc.* **1992**, *114*, 7146-7151.
5. Shaffer, S. A.; Tureček, F.; Cerny, R. L. "The Dimethylaminomethyl Radical. A Neutralization-Reionization and ab Initio Study." *J. Am. Chem. Soc.* **1993**, *115*, 12117-12124.
6. Shaffer, S. A.; Tureček, F. "Hydrogentrimethylammonium. A Marginally Stable Hypervalent Radical." *J. Am. Chem. Soc.* **1994**, *116*, 8647-8653.
7. Gatlin, C. L.; Tureček, F.; Vaisar, T. "Copper(II) Amino Acid Complexes in the Gas Phase." *J. Am. Chem. Soc.* **1995**, *117*, 3637-3638.
8. Tureček, F.; Cramer, C. J. "Thermochemistry of Simple Enols and Enol Cation-Radicals Revisited. A G2(MP2) ab Initio Study." *J. Am. Chem. Soc.* **1995**, *117*, 12243-12253.
9. Vaisar, T.; Gatlin, C. L.; Tureček, F. "Oxidation of Peptide-Copper Complexes by Alkali Metal Cations in the Gas Phase." *J. Am. Chem. Soc.* **1996**, *118*, 5314-5315.
10. Frank, A. J.; Sadílek, M.; Ferrier, J. G.; Tureček, F. "Hydroxysulfinyl Radical and Sulfinic Acid Are Stable Species in the Gas Phase." *J. Am. Chem. Soc.* **1996**, *118*, 11321-11322.
11. Nguyen, V. Q.; Sadílek, M.; Frank, A. J.; Ferrier, J. G.; Tureček, F. "Metastable States of Dimethylammonium Radical." *J. Phys. Chem. A*, **1997**, *101*, 3789-3799.
12. Frank, A. J.; Sadílek, M.; Ferrier, J. G.; Tureček, F. "Sulfur Oxyacids and Radicals in the Gas Phase: A Variable-Time Neutralization-Photoexcitation-Reionization Mass Spectrometric and Ab Initio/RRKM Study." *J. Am. Chem. Soc.* **1997**, *119*, 12343-12353.
13. Tureček, F. "Proton Affinity of Dimethyl Sulfoxide and Relative Stabilities of C_2H_6OS Molecules and $C_2H_7OS^+$ Ions. A Comparative G2(MP2) ab Initio and Density Functional Theory Study." *J. Phys. Chem. A*, **1998**, *102*, 4703-4713.
14. Tureček, F. "Modeling Nucleobase Radicals in the Mass Spectrometer". *J. Mass Spectrom.* **1998**, *33*, 779-795.
15. Gerber, S. A.; Scott, C. R.; Tureček, F.; Gelb, M. H. "Analysis of Rates of Multiple Enzymes in Cell Lysates by Electrospray Ionization Mass Spectrometry." *J. Am. Chem. Soc.* **1999**, *121*, 1102-1104.
16. Gygi, S. P.; Rist, B.; Gerber, S. A.; Tureček, F.; Gelb, M. H.; Aebersold, R. "Isotope Coded Affinity Tags." *Nature Biotechnol.* **1999**, 17, 994-999. ***Cited more than 2900 times***.
17. Tureček, F.; Polášek, M.; Frank, A. J.; Sadílek, M. "Transient Hydrogen Atom Adducts to Disulfides. Formation and Energetics." *J. Am. Chem. Soc.* **2000**, *122*, 2361-2370.
18. Polášek, M.; Tureček, F. "Hydrogen Atom Adducts to Nitrobenzene. Formation of the Phenylnitronic Radical in the Gas Phase and Energetics of Wheland Intermediates." *J. Am. Chem. Soc.* **2000**, *122*, 9511-9524.
19. Zhou, X.-F.; Tureček, F.: Scott, C. R.; Gelb, M. H. "Quantitation of Cellular Acid Sphingomyelinase and Galactocerebroside β-Galactosidase Activities by Electrospray Ionization Mass Spectrometry." *Clin. Chem.* **2001**, *45*, 874-881.
20. Polášek, M.; Tureček, F.; Gerbaux, P.; Flammang, R. "Nitrobenzene Isomers." *J. Phys. Chem. A,* **2001**, *105*, 995-1010.
21. Tureček, F. "Mass Spectrometry in Coupling with Affinity Capture-Release and Isotope-Coded Affinity Tags for Quantitative Protein Analysis." *J. Mass Spectrom.* **2002**, *37*, 1-14.
22. Ogata, Y.; Scampavia, L.; Růžička, J.; Gelb, M. H.; Tureček, F. "Automated Two Dimensional Monitoring of Affinity Capture-Release of Biotinylated Conjugates Using a Lab-on-Valve Apparatus Coupled to UV/VIS and Electrospray Ionization Mass Spectrometry." *Anal. Chem.* **2002**, *74*, 4702-4708.

23. Tureček, F.; Syrstad, E. A. "Mechanism and Energetics of Intramolecular Hydrogen Transfer Atom Transfer in Amide and Peptide Radicals and Cation-Radicals." *J. Am. Chem. Soc*. **2003**, *125*, 3353-3369.
24. Tureček, F. "Transient Intermediates of Chemical Reactions by Neutralization-Reionization Mass Spectrometry." *Top. Curr. Chem.* **2003**, *225*, 77-129.
25. Lu, Y.; Bottari, P.; Tureček, F.; Aebersold, R.; Gelb, M. H. "Absolute Quantification of Specific Proteins in Complex Mixtures Using Visible Isotope-Coded Affinity Tags." *Anal. Chem.* **2004**, *76*, 4104-4111.
26. Chen, X.; Syrstad, E. A.; Gerbaux, P.; Nguyen, M. T.; Tureček, F. "Distonic Isomers and Tautomers of Adenine Cation Radical in the Gas Phase and Aqueous Solution." *J. Phys. Chem. A* **2004**, *108*, 9283-9293.
27. Volný, M.; Elam, W. T.; Branca, A.; Ratner, B. D.; Tureček, F. "Preparative Soft and Reactive Landing of Multiply Charged Protein Ions on a Plasma-Treated Metal Surface." *Anal. Chem.* **2005**, *77*, 4890-4896.
28. Syrstad, E. A.; Tureček, F. "Toward a General Mechanism of Electron-Capture Dissociation." *J. Am. Soc. Mass Spectrom.* **2005**, *16*, 208-224.
29. Blacken, G. R.; Gelb, M. H.; Tureček, F. "Metal Affinity Capture Tandem Mass Spectrometry for the Selective Detection of Phosphopeptides." *Anal. Chem.* **2006**, *78*, 6065-6073.
30. Chen, X.; Tureček, F. "The Arginine Anomaly: Arginine Radicals Are Poor Hydrogen Atom Donors in Electron Transfer Induced Dissociations." *J. Am. Chem. Soc.* **2006**, *128*, 12520-12530.
31. Tureček, F. "Copper-biomolecule complexes in the gas phase. The ternary way." *Mass Spectrom. Rev.* **2007**, *26*, 563-582.
32. Tureček, F.; Scott, C. R.; Gelb, M. H. "Tandem mass spectrometry in the detection of inborn errors of metabolism for newborn screening." *Methods in Molecular Biology* (Totowa, NJ, United States) (2007), **359** (Quantitative Proteomics by Mass Spectrometry), 143-157.
33. Hayakawa, S.; Hashimoto, M.; Matsubara, H.; Tureček, F. "Dissecting the proline effect: Dissociations of proline radicals formed by electron transfer to protonated Pro-Gly and Gly-Pro dipeptides in the gas phase." *J. Am. Chem. Soc.* **2007**, *129*, 7936-7949.
34. Blacken, G. R.; Volny, M.; Vaisar, T.; Sadilek, M.; Tureček, F. "In Situ Enrichment of Phosphopeptides on MALDI Plates Functionalized by Reactive Landing of Zirconium(IV)-n-Propoxide Ions." *Anal. Chem.* **2007**, *79*, 5449-5456.
35. Wang, Y.; Scott, C. R.; Gelb, M. H.; Tureček, F. "Direct Assay of Enzymes in Heme Biosynthesis for the Detection of Porphyrias by Tandem Mass Spectrometry. Porphobilinogen Deaminase." *Anal. Chem.* **2008**, *80*, 2606-2611.
36. Tureček, F.; Chen, X.; Hao, C. "Where Does the Electron Go? Electron Distribution and Reactivity of Peptide Cation-Radicals Formed by Electron Transfer in the Gas Phase." *J. Am. Chem. Soc.* **2008**, *130*, 8818-8833.
37. Jones, J. W.; Shaffer, S. A.; Ernst, R. K.; Goodlett, D. R.; Tureček, F. "Determination of Pyrophosphorylated Forms of Lipid A in Gram-Negative Bacteria Using a Multi-Varied Mass Spectrometric Approach." *Proc. Natl. Acad. Sci. U.S.A.* **2008**, *105*, 12742-12747.
38. Tureček, F.; Panja, S.; Wyer, J. A.; Ehlerding, A.; Zettergen, H.; Nielsen, S. B.; Hvelplund, P.; Bythell, B.; Paizs, B. "Carboxyl-Catalyzed Prototropic Rearrangements in Histidine Peptide Radicals upon Electron Transfer. Effects of Peptide Sequence and Conformation." *J. Am. Chem. Soc.* **2009**, *131*, 16472-16487.
39. Blacken, G. R.; Volný, M.; Jackson, K. J.; Ranjitkar, P.; Maly, D. J.; Tureček, F. "Reactive Landing of Gas-Phase Ions as a Tool for the Fabrication of Metal Oxide Surfaces for *in situ* Phosphopeptide Enrichment." *J. Am. Soc. Mass Spectrom.* **2009**, *20*, 915-926.
40. Bollinger, J.; Thompson, W.; Lai, Y.; Oslund, R. C.; Hallstrand, T. S.; Sadilek, M.; Tureček, F.; Gelb, M. H. "Improved Sensitivity Mass Spectrometric Detection of Eicosanoids by Charge Reversal Derivatization." *Anal. Chem.* **2010**, *82*, 6790-6796.
41. Duffey, T. A.; Bellamy, G.; Diaker, J.; Elliott, S.; Glass, M.; Scott, C. R.; Tureček, F.; Gelb, M. H. "Triplex Tandem Mass Spectrometry for Newborn Screening of Fabry, Pompe and Mucopolysaccharidosis I (Hurler Syndrome): Results of a Pilot Study." *Clin. Chem.* **2010**, *56*, 1854-1861.
42. Tureček, F.; Chung, T. W.; Moss, C. L.; Wyer, J. A.; Ehlerding, A.; Holm, A. I. S.; Zettergren, H.; Nielsen, S. B.; Hvelplund, P.; Chamot-Rooke, J.; Bythell, B.; Paizs, B. "The Histidine Effect. Electron Transfer and Capture Cause Different Dissociations and Rearrangements of Histidine Peptide Cation-Radicals." *J. Am. Chem. Soc.* **2010**, *132*, 10728-10740.
43. Gregersen, J. A.; Tureček, F. "Mass-Spectrometric and Computational Study of Tryptophan Radicals (Trp + H)$^{\bullet}$ Produced by Collisional Electron Transfer to Protonated Tryptophan in the Gas Phase." *Phys. Chem. Chem. Phys.* **2010**, *12*, 13434-13447.
44. Moss, C. L.; Chung, T. W.; Wyer, J. A.; Nielsen, S. B.; Hvelplund, P. Tureček, F. "Dipole-Guided Electron Capture Causes Abnormal Dissociations of Phosphorylated Pentapeptides." *J. Am. Soc. Mass Spectrom.* **2011**, *22*, 731-751.

Based on the bibliographical data on SciFinder and ISI, my publications have been cited >11,000 times with an h-factor of 44.

VI. Grant Activity:

Previous periods: NSF Chemistry Division (1991, 1994, 1998, 2001, 2003), ACS Petroleum Research Fund, Bruker Daltonik, Selectide-Aventis (1998-2002, $600,000 total), Genzyme Medical Devices (2003-2005, $197,000 direct)

NSF (CHE 0750048) Transient Intermediates in Electron and Proton Transfer.	2008-2011	$406,250
NIH-NIDDK, Multiplex Analysis of Inborn Errors of Metabolism, R01 DK67859-04	2003-2006	$796,503
NIH-NIDDK, Multiplex Analysis of Inborn Errors of Metabolism, R01 DK67859-07	2006-2009	$936,000
NIH-NIDDK, Supplement for a purchase of a tandem mass spectrometer	2007	$75,000
UW Royalty Research Fund, Reactive Landing of Polyatomic Ions on Metal Surfaces	2004-2005	$29,702
NSF-CRIF (CHE-034956) Theoretical Chemistry Computer Facility	2004-2007	$271,596
BioMarin, Inc. Development of Assays for Mucopolysaccharidosis VI	2008-2009	$376,000
NIH-NIDDK, Multiplex Analysis of Inborn Errors of Metabolism, R01 DK67859-010	2009-2013	$1,248,000
NIH-NIGMS, Single Cell Analysis, R01 GM094905-02	2010-2014	$1,228,000

VII. Honors and Awards:

Czechoslovak Academy of Sciences Award (1979); Czech Literary Fund Award (1981); J. Heyrovsky Institute Award for Best Young Scientist (1982); Czechoslovak Academy Award for Young Scientists (1982); Honorary Plaque of the Czechoslovak Academy of Sciences (1983); 500 Leaders of Science, American Biographical Institute (2002); P. B. Hopkins Faculty Award, University of Washington, 2006; Honorary Medal, Inst. of Organic Chemistry & Biochemistry, Czech Academy of Sciences, 2006. VIP Faculty Fellowship, Dept. of Physics & Astronomy, U. of Aarhus, Denmark, 2007; Visiting Professorships, Ecole Polytechnique Palaiseau and Universite Pierre et Marie Curie, Paris, 2006, 2007 and 2010; J. J. Marci Medal of the Czech Spectroscopic Society, 2010; Czech Head Patria Science Award, 2010.

Editorial Boards and Other Professional Activities
Founding Editor, Journal of Mass Spectrometry since 1995; Editorial Board, International Journal of Mass Spectrometry since 2000; Editorial Board, *Spectroscopy Letters* 2003-2007; Appointed to Int'l Advisory Board of the *Institute of Organic Chemistry & Biochemistry, Czech Academy of Sciences*; Elected Secretary, Am. Soc. for Mass Spectrometry, 2005-2007, Appointed to Editorial Board of *Advances in Physical Chemistry;* Continues as Editor of *Journal of Mass Spectrometry*. Founding Director and Chief Scientist, Intelligent Ion, Inc., 1999-2004; Staff Scientist, PNNL, Richland, WA (1996); Consultant for Zymogenetics, Seattle, WA (1996), 21st century Research Corporation, Poulsbo, WA (1996-1999), SchiffHardin LLC, Chicago (2004-2006), LXE Energy Enterprises, Poulsbo, WA (2010-present).

VIII. Additional Comments on Research, Teaching, and Service:

Over the years I served on several review panels, for example: Review Panel of U.S. Civilian Research and Development Foundation, 1996; National Science Foundation Review Panel for Major Instrumentation in Biology, 1997; National Institutes of Health, Review Panel for Major Instrumentation, 2005, 2006, and 2007; National Science Foundation Ad Hoc Review Panel for Major Instrumentation, 2009; National Science Foundation Division of Chemistry Review Panel, 2008, ;International Advisory Board, Institute of Organic Chemistry and Biochemistry, Academy of Sciences of the Czech Republic, 2004-present.

I also taught several extra- and intramural mass spectrometry courses, for example: Short Course on Mass Spectrometry, Pardubice, Czechoslovakia, 1986; Short Course on Interpretation of Mass Spectra, York Wastewater Laboratories, November 1988; Short Course on Advanced Interpretation of Mass Spectra, 39th ASMS Conference on Mass Spectrometry and Allied Topics, Nashville, TN, May 1991; Short Course on Advanced Interpretation of Mass Spectra, 40th ASMS Conference on Mass Spectrometry and Allied Topics, Washington, DC, May 1992; Short Course on Mass Spectrometry, Charles University, Prague, September 1994; Short Course on Mass Spectrometry, Exxon Research, Florham Park, NJ, 1994, 1995; Short Course on Mass Spectrometry, Hewlett-Packard, Naperville, IL, 1995; Mass Spectrometry of Drugs, Toxicants and metabolites, MEDCH 530, and Mass Spectrometry Based Proteomics, MEDCH 541, 2003-2009; Summer Course on Mass Spectrometry, Pec pod Snezkou, Czech Republic, September 2010.

Summary of Selected Professional Activities

Name: **Gabriele Varani** Date of Revised Vitae: **5/25/2011**
Rank: **Professor** Date of PhD: **1987** Date of UW hire: **2001** Date of last promotion: **2001**

I. Courses Taught:

Chemistry 453 (10 times), Chemistry 152 (4 times); NMR for biological sciences (4 times); Biochemistry 530 (8 times); Biochemistry 540/541/542 (8 times); various other seminars, courses, etc

II. Department and University Service:

Chemistry: Chair's Advisory committee (2002-present); Personnel Committee (2003-present); Research Services (2002-2003); Chemical Biology Search (2002)
Biochemistry: Seminar's Committee (2002-2004); Faculty Search Committee (2003-2004)
Graduate education BMSD steering committee (2008-present); Initiative to Maximize Student Diversity: Advisory Board (2009-present); Health Sciences Center Minority Students Program Advisory Board (2010-present)
Other: Quinquennial Reviewing Committee, EMBL Heidelberg; NIH Special Emphasis Panel 2004; NIH BBC-A 2005; NSF Instrumentation Panel 2004; NIH MFSB 2005, 2007; NIH Biophysics Fellowship Panel, 2006; NIH MFSD 2008; NIH EBT 2009; NIH Instrumentation Panel 2010; Special Emphasis panel, 2010; MFSD 2011; Pittsburgh Center for HIV Protein Interaction: Advisory Board (2008-present);
Ad hoc reviewer: NIH, NSF, Wellcome Trust, MRC, Italian Ministry of Education, HFSP, French CNRS, etc.

>30 Total Other Graduate Supervisory Committees: (does not include students in own group)

III. Research Group (current):

5	graduate students	6	Postdoctoral associates	14	Ph.D.s granted (career total)
3	undergraduate students	0	other Visiting Faculty	3	Masters granted

IV. Invited Lectures: career total 200

2011 Computational NMR Gordon Conference, Lucca; American Society of Gene and Cell Therapy, Seattle; University of Michigan , Biophysics*;* Oregon State University; Keystone symposium NMR in Molecular Biology, Montana ***2010*** RNA in Motion Symposium, University of Iowa; 25th ICMRBS, Cairns Australia; World Wide Magnetic resonance Conference, Florence; Tinoco 80th Birthday Symposium, Berkeley; Annual NIH Structural Biology AIDS Meeting, Washington; CHDI Foundation, Los Angeles ***2009*** RNA dynamics, Telluride; European Biophysical Society Meeting, Genova*;* Alternative Splicing Meeting, Stockholm; ENC Asilomar; University of Massachussets Medical School, Biochemistry ***2008*** MRC Laboratory of Molecular Biology, Cambridge*;* Center for Research in Biomedicine, Bellinzona, Switzerland*;* Distinguished Lecture, GeorgiaTech Atlanta; University of Texas Southwestern Medical Center, Dallas*;* Fragment-based Ligand Discovery Conference, San Diego*;* Wayne State University, Chemistry ***2007*** IDDST 2007, Beijing (presented by Dr Yu Chen)*;* RNA-ligand interaction, Frankfurt German NMR Conference, Gottingen, Germany*;* 2nd European Syposium on Chemistry and Biology, Wroclaw*;* ACS Symposium on Protein-Nucleic Acid Interactions, Boston ACS Meeting*;* FEBS Symposium, Transient Interactions of Biological Macromolecules Seville; Ohio State University, Biochemistry; ACS Symposium on RNA Biophysics, Chicago ACS meeting; SUNY at Buffalo, Chemistry ***2006*** Southeast Magnetic Resonance Conference, Gainsville; University of Florida, Biochemistry*;* ICMRBS Gottingen*;* RNA Society, Session Chair*;* University of Utah, Biochemistry; ENC Asilomar; University of Michigan, Chemistry; University of North Carolina, Biochemistry*;* NMR Igler Symposium, Innsbruck*;* University of Georgia, Biochemistry ***2005*** Florida State University, Chemistry and Biochemistry*;* University of Strasbourg*;* mRNA 3'-end formation, Oxford*;* Keystone Symposium NMR in Molecular Biology, Bannf*;* 21st ICMRBS, Hyderabad, India; ***2004*** Biophysical Society of Taiwan, Taipei; ACS symposium, Replication and Translation, Philadelphia; UCLA, Biochemistry; University of Montana, Biochemistry; UC Berkeley, Structural Biology; Case Western Reserve Medical School, Molecular Biology ***2003*** NIEHS, Structural Biology Symposium, Research Triangle Park Seattle Translational Control Group; Universita' di Napoli, Chemistry; Nature-Aventis 2nd Horizon Symposium – RNA, Portland; MRC Cambridge, The Golden Double Helix (Meeting organizer); Fred Hutchinson Cancer Center; North Carolina State University, Department of Biochemistry ***2002*** Institute of Molecular Biology, University of Oregon; XX Magnetic Resonance in Biological System Toronto; Institute of Molecular Biology, ETH Zurich Department of Physics, Universita' di Milano; Danish NMR Meeting, Copenhagen; Department of Molecular Biology, University of California Santa Cruz; Department of Biochemistry, University of British Columbia; Biophysical Society Annual Meeting, San Francisco ***2001*** Biochemical Society Meeting, York; Rockefeller University, New York; 3'-end mRNA Formation,

Oxford; ESF Conference on RNA processing, Granada, Spain; Conversation on Biomolecular Stereodynamics, Albany; Nacon V, Sheffield

V. Publications: career total [156] in press [ ] submitted [ ] book chapters, reviews [ ]

153. I. H. Norville, K. O'Shea, M. Sarkar-Tyson, S. Zheng, R. W. Titball, G. Varani and N. J. Harmer The structure of a *Burkholderia pseudomallei* immunophilin-inhibitor complex reveals new approaches to antimicrobial development *Biochem J.* (2011)
152. M. S. Lalonde, M. A. Lobritz, A. Ratcliff, Z. Athanassiou, Mudit Tyagi, J. A. Robinson, J. Karn, G. Varani and E. J. Arts Dual inhibition of HIV-1 reverse transcription and mRNA transcription by a conformationally constrained peptidomimetic that binds the Tat-transactivating response element (TAR) in HIV-1 genomic RNA *PLOS Pathogens* (2011)
150. A. Davidson, D. W Begley, C. Lau and G. Varani A small molecule probe induces a conformation in HIV TAR RNA capable of binding drug-like fragments J. Mol Biol. (2011)
148. A. Davidson, K. Patora-Komisarska, J. A. Robinson, G. Varani Essential structural requirements for specific recognition of HIV TAR RNA by peptide mimetics of Tat protein *Nucleic Acids Res*. **39** 248-256 (2011)
147. W. Huang, G.Varani and G. P. Drobny ^{13}C-^{19}F Intermolecular REDOR NMR Study of the Interaction of TAR RNA with Tat Peptides *J. Am. Chem. Soc.* **132** 17643-5 (2010)
146. P. Emani, G. L. Olsen, D. C. Echodu, G. Varani and G. P. Drobny A slow exchange theory of conformational capture in RNA *J. Phys. Chem. B* **114** 15991-6002 (2010)
145. T. C. Leeper, X. Qu, C. Lu, C. Moore and G. Varani Recognition of yeast mRNA 3'-end processing signals by Hrp1 and Rna15 proteins *J. Mol. Biol.* **401** 334-349 (2010)
144. B. M. Lunde, S. L. Reichow, M. Kim, S. Buratowski, A. Meinhart and G. Varani, Recruitment of transcription termination factors by cooperative interactions with the RNA polymerase II C-terminal domain *Nature Struct Mol Biol* **17** 1195-1201 (2010)
142. M.-K. Lee, M. Gal, L. Frydman and G. Varani Real-time multidimensional NMR folding the adenine-sensing riboswitch with second resolution *PNAS* **107** 9192-9197 (2010)
139. G. L. Olsen, M. F. Bardaro, D. C. Echodu, G. P. Drobny and G. Varani Atomic motions of RNA in space and time *J. Am. Chem. Soc.* **132** 303-308 (2010)
138. Y. Liu, E. Peacey, J. Dickson, C. P. Donahue, S. Zheng, G. Varani and M. S. Wolfe Mitoxantrone Analogues as Ligands for a Stem-Loop Structure of Tau Pre-mRNA **52** 6523-6526 *J. Med. Chem.* (2009)
137. D. W. Begley and G. Varani Locking our Viral Replication *Nature Chem Biol*. **5** 782-783 (2009)
134. A. Davidson, T. C. Leeper, Z. Athanassiou, K. Patora-Komisarska, J. Karn, J. A. Robinson and G. Varani Simultaneous recognition of HIV-1 TAR RNA bulge and loop sequences by cyclic peptide mimics of Tat protein *Proc. Natl. Acad. Sci. USA* **106** 11931-11936 (2009)
133. K. S. Godin, H. Walbott, N. Leulliot, H. van Tilbeurgh and G. Varani The Box H/Aca snoRNP assembly factor Shq1 is a chaperone protein homologous to Hsp90 co-chaperones that interacts withn the Cbf5 enzyme *J. Mol Biol.* **390** 231-244 (2009)
132. S. Zheng, Y. Chen, C. Donahue, M. S. Wolfe and G. Varani "Structural basis for stabilization of the tau pre-mRNA splicing regulatory element by novatrone (mitoxantrone)" *Chem Biol* **16** 557-566 (2009)
131. M. Bardaro, Z. Shajani, K. Patora, J. A. Robinson and G. Varani "Binding of small molecule ligands to HIV-1 TAR alters its Motional Landscape" *Nucleic Acids Res.* **37** 1529-1540 (2009)
130. Y. Chen, J. Mandic and G. Varani "Cell-free selection of RNA-binding proteins using *in vitro* compartmentalization" *Nucleic Acids Res.* **36** (2008)
129. D. Echodu, G. Goobes, Z. Shajani, K. Pederson, G. Meints, G. Varani and G. Furanose "Dynamics in the HhaI Methyltransferase Target DNA Studied by Solution and Solid State NMR Relaxation" *J. Phys. Chem.* **112** 13934-13944 (2008)
128. C. M. Gherghe, Z. Shajani, K. A. Wilkinson, G. Varani, K. M. Weeks "Strong correlation between SHAPE chemistry and the generalized NMR order parameter in RNA" *J. Am. Chem. Soc.* **130** 12244-12245 (2008)
124. Olsen, D. Echodu, Z. Shajani, M. Bardaro, G. Varani and G. P. Drobny "Solid-State Deuterium NMR Studies Reveal us-ns Motions in the HIV-1 TAR RNA Recognition Site" *J. Amer. Chem.* **130** 2896-2897 (2008)
121. P. Deka, M. E. Bucheli, C. Moore, S. Buratowski and G. Varani "Structural Studies of the Interaction of the Yeast SR protein Npl3 with 3′-End Processing Sites" *J. Mol. Biol.* **375** 136-150 (2007)
118. N. Leulliot, K. S. Godin, C. Hoareau-Aveilla, S. Quevillon-Cheruel, G. Varani, Y. Henry, H. Van Tilbeurgh "The box H/ACA RNP assembly factor Naf1p contains a domain homologous to Gar1p mediating its interaction with Cbf5p" *J. Mol. Biol.* **371** 1338-1353 (2007)
116. B. Lunde, C. Moore and G. Varani "RNA binding proteins; a modular design for efficient function" *Nature Rev. Mol. Cell Biol.* **8** 479-490 (2007)

115. S. L. Reichow, T. Hamma, A. Ferré-D' Amaré and G. Varani "The structure and function of small nucleolar ribonucleoproteins" *Nucleic Acids Res.* **35** 1452-1464 (2007)
113. A. Watters, P. Deka, C. Corrent, G. Varani, T. Sosnick and D. A. Baker "The folding free energy landscape of Top7 is more complex than those of naturally occurring proteins" *Cell* **128** 613-624 (2007)
112. G. Dantas, C. Corrent, S. L. Reichow, J. J. Havranek, Z. M. Eletr, B. Kuhlman, G. Varani, E. Merritt, D. A. Baker High-resolution structural and thermodynamic analysis of extreme stabilization of human procarboxypeptidase by computational protein design *J. Mol. Biol.* **366** 1209-1221 (2007)
111. X. Qu, J. M. Pérez-Cañadillas, S. Agrawal, J. DeBaecke, G. Varani and C. Moore "The C-terminal domains of vertebrate CstF-64 and its yeast orthologue Rna15 form a new structure critical for mRNA 3'-end processing." *J. Biol. Chem.* **282** 2101-2115 (2007)
108. P. A. Miller, Z. Shajani, G. A. Meints, D. Caplow, G. Goobes, G. Varani and G. P. Drobny "Contrasting views of the internal dynamics of the HhaI Methyltransferase target DNA reported by solution and solid-state NMR spectroscopy" *J. Am. Chem. Soc.* **128** 15970-15971 (2006)
107. G. Dantas, A. L. Watters, B. Lunde, Z. Eletr, N. Isern, B. Kuhlman, B. L. Stoddard, G. Varani and D. A. Baker "Mis-translation of a Computationally Designed Protein Yields an Exceptionally Stable Homodimer: Implications for Protein Engineering and Evolution" *J. Mol. Biology* **362** 1004-1024 (2006)
105. S. Reichow and G. Varani "RNA switches function" *Nature* **441** 1054-1055 (2006)
104. Y. Chen, J. Fender, J. D. Legassie, M. B. Jarstfer T. M. Bryan and G. Varani "The structure of stem-loop IV of Tetrahymena telomerase RNA identifies a conformational switch important for enzymatic activity" *EMBO J.* **25** 3156-3166 (2006)
101. H. D. Cho, Y. Chen, G. Varani, A. M. Weiner "A model for C74 addition by CCA-adding enzymes: C74 addition, like C75 and A76 addition, does not involve tRNA translocation" *J. Biol. Chem.* **281** 9801-11 (2006)
100. T. Hamma, S. L. Reichow, G. Varani, A. R. Ferré-D'Amaré "The Dyskerin-Nop10 complex: a conserved molecular bracket at the core of the box H/ACA snoRNP" *Nature Struct Mol. Biol.* **12** 1101-1107 (2005)
95. Z. Shajani and G. Varani, "^{13}C NMR relaxation studies of RNA base and ribose nuclei reveal a complex pattern of motions in the RNA binding site for human U1A protein" *J. Mol. Biol.* **349** 699-715 (2005)
93. P. Deka, J. M. Perez-Canadillas, R. K. Paranji and G. Varani, "Protein and RNA dynamics play a key role in determining the specific recognition of GU-rich polyadenylation regulatory elements by human Cstf-64 protein," *J. Mol. Biol*. **347** 719-733 (2005)
90. Y. Chen, T. Kortemme, T. Robertson, D. Baker and G. Varani, A new hydrogen-bonding potential for the design of protein-RNA interactions predicts specific contacts and discriminated decoys. *Nucleic Acids Res*. **32** 5147-5162 (2004)
89. C. Detering and G. Varani Validation of automated docking programs for docking and database *J. Med. Chem*. **47** 4188-4201 (2004)
88. N. Leulliot, S. Quevillon-Cheruel, M. Graille, H. van Tilbeurgh T. L Leeper, T. E Edwards, Sn. Sigurdsson, N. Rozenkrants R. J. Nagel, K. S Godin, M. Ares, Jr., G. Varani A new α-helical extension promotes RNA-binding by the dsRBD of Rnt1p RNAse III *EMBO J* **23** 2468-2477 (2004)
87. Z. Athanassiou, R. L. A. Dias, K. Moehle, N. Dobson, G. Varani and J. A. Robinson Structural Mimicry of Retroviral Tat Proteins by Constrained β-Hairpin Peptidomimetics: Ligands with High Affinity and Selectivity for Viral TAR RNA Regulatory Elements *J. Am. Chem. Soc*. **126** 6906-6913 (2004)
86. B. Davis, M. Afshar, G. Varani, A. I. H. Murchie, J. Karn, G. Lentzen, M. Drysdale, J. Bower, A. J. Potter, I. D. Starkey, T. Swarbrick, and F. Aboul-ela. Rational Design of Inhibitors of HIV-1 TAR RNA Through the Stabilization of Electrostatic Hot Spots *J. Mol. Biol*. **336** 343-356 (2004)
85. B. Kuhlman, G. Dantas, G. C. Ireton, G. Varani, B. L. Stoddard and D. A. Baker. Design of a Novel Globular Protein Fold with Atomic Level Accuracy *Science* **302** 1364-1368 (2003)
81. J-M. Perez-Canadillas and G. Varani Recognition of GU-rich polyadenylation regulatory elements by human Cstf-64 protein *EMBO J.* **22** 2821-2830 (2003)
79. T. L. Leeper, N. Leulliot and G. Varani The solution structure of an essential stem-loop of human telomerase RNA *Nucleic Acids Res.* **31** 2614-2621 (2003)
78. J. Greatorex, J. Gallego, G. Varani and A. Lever. Structure and stability of wild-type and mutant RNA internal loops from the SL-1 domain of the HIV-1 packaging signal *J. Mol. Biol*. **322** 543-554 (2002)
75. J. A. Collier, J. Gallego, R. Klinck, P. T. Cole, S. J. Harris, G. P. Harrison, F. Aboul-Ela, G. Varani, S. Walker: A conserved RNA structure within the HCV IRES eIF3-binding site. *Nat Struct Biol.* **9** 375-380 (2002)
73. J. Gallego and G. Varani. Targeting RNA with Small-Molecule Drugs: Therapeutic Opportunities and Chemical Challenges. *Acc. Chem. Res.* **34** 836-843 (2001)

71. N. Leulliot and G. Varani. Current Topics in RNA-Protein Recognition: Control of Specificity and Biological Function through Induced Fit and Conformation Capture. *Biochemistry* **40**, 7947-7955 (2001)

VI. Grant Activity: *(only current grants only are listed for brevity, direct yearly amounts are listed for reference)*

NIH RO1 – *3'-end processing*	2002-2011	$250,000/yr
NIH RO1 – *Dynamics of proteins and Nucleic acids* (co-PI; PI: Drobny)	2004-2013	$250,000/yr
NHI RO1 – *New HIV Inhibitors*	2007-2012	$350,000/yr
NIH-RO1 – *Protein design*	2009-2011	$225,000/yr
NSF – *TAR RNA dynamics* (co-PI Drobny)	2007-2010	$125,000/yr
NIH Contract - *Seattle Structural Genomics* (co-PI; PI: Myler)	2007-2012	$125,000/yr
NIH R25 - *UW PREP minority post-bac*	2011-2015	$320,000/yr
CHDI Foundation – HDAC4 in Huntington disease	2011-2012	$100,000/yr
Large equipment grants		
NIH – 800 Mhz spectrometer (co-PI, PI Drobny)	2010-2011	$3,000,000
NIH/NSF S10 – *New 600 Mhz spectrometer* (Klevit PI)	2004-2005	$1,000,000
NIH S10 – *New 750 Mhz spectrometer*	2005-2006	$500,000

VII. Honors and Awards:

Visiting Professor, Universita' di Roma II, 2000; Gilead Lecture, Sheffield 2001
Faculty of 1000: Cell Biology, Control of gene Expression
Editorial Board *Nucleic Acids Res*. 1999-2002; Associate Editor – *E. J. of Biochemistry* 2003-present
AAAS Cleveland-Newcombe Prize Science 2004

VIII. Additional Comments on Research, Teaching, and Service:

Research: I have continued to publish in nice journals and my productivity is excellent. Funding so far has been very good, although I am sure sooner or later the funding rates will affect my research group. We have several distinctive lines of research which are all progressing well. I would like to become involved in biotechnology again and I am actively seeking opportunities to start something that could be successful. With the award of a new 800 Mhz spectrometer, we have finally completed setting up the NMR infrastructure at UW. The goal of the next few years is to achieve the following scientific goals: 1) Engineer RNA-binding proteins to direct gene expression of microRNAs; 2) Improve the antiviral activity of RNA-binding ligands based on peptidomimetic chemistry; 3) Determine structure of the mRNA 3'-end processing apparatus; 4) Establish how RNA and protein motions affect molecular recognition through NMR studies.

Teaching: I continue to teach CHEM 453, and sometimes CHEM 152 in the summer and have been a lecturer or course organizer for numerous graduate courses in Biochemistry (e.g. BIOC 530) and the Biomolecular Structure and Design Program; I have conducted several Graduate courses in the BMSD program as well. With Klevit, we teach a course every two years on biomolecular NMR which has between 10 and 20 attendants. In addition to undergraduate teaching, I supervise 5-6 graduate students and 2-3 undergraduate students from the Chemistry, Biochemistry and BMSD programs. I wish I had time to teach CHEM 453 differently, but it would take an enormous amount of work and I doubt the students would find it any easier or any less intimidating. While students are reasonably happy with my teaching, they find the subject to be too far from their primary interests and intimidating. It is my goal to increase their appreciation of the subject by bringing as much biology as possible into the lectures. As usual, the primary limitation is time. Actually, CHEM 152 could use creative teaching much more than CHEM 453, by the time I see students as seniors, it is too late to help, they are already fully institutionalized and have lost most of their innate ability to reason. As part of my interest in and commitment to minority education, I am the PI of a new grant to support a minority baccalaureate program (UW PREP), serve on the IMSD advisory board and in the Health Sciences Center Minority Students Program Advisory Board.

Service: I have served on Faculty search committees in both Chemistry and Biochemistry and in the training programs. I serve on 20+ graduate student committees in addition to those of the students in my group. I serve on NIH study sections regularly as an *ad hoc* member, in addition to various committees in Europe and *ad hoc* requests from NIH, NSF, France, England, New Zealand, etc. Less would be more.

Summary of Selected Professional Activities

*(Maximum Length: **Four** Pages)*

Name: Lloyd W. Burgess — Date of Revised Vitae:6 June 2011

Rank: Research Professor — Date of Ph.D.: 1985 — Date of UW hire: 1985 — Date of last promotion: 1999

I. Courses Taught: N/A

As a research professor I do not normally teach except occasional guest lectures.

II. Department and University Service:

Departmental Committees:

CPAC Re-envisioning committee

College and University Committees:

Molecular Life Sciences Center Steering Committee
Washington Technology Center Microelectronics and Computer Systems Committee
CPAC Industrial Advisory Board Steering Committee

5	Total Current Other Graduate Supervisory Committees: (does not include students in own group)

III. Research Group (current):

3	graduate students		Postdoctoral associates	12	Ph.D.s granted (career total)
	undergraduate students		other Visiting Faculty		

IV. Invited Lectures: career total 43

Selected most recent:

- L.W. Burgess, and Babak Parviz, "Tools and Platforms for Single-Cell Biology" AVS 54th International Symposium, Seattle WA, 2007 (Invited Talk).
- L.W. Burgess, Eastern Analytical Symposium, "Coherent Optical Scattering for Applications in Process Monitoring", 2005 (Invited Talk).
- L.W. Burgess, Consumer Healthcare Products Assn., Manufacturing Controls Seminar, Morristown, NJ, "Advances and Challenges in Process Analytical Technology (PAT)" 2005:
- L.W. Burgess, "Recent Advances and Initiatives in Process Analytical Technology" Merck & Co., New Jersey, 2004 (Invited Talk).
- L.W. Burgess, "Process Analytical Chemistry", Enric Cassas Memorial Workshop on Process Analytical Chemistry (PAC'03) Barcelona (Spain), 2003
- McGill University, Montréal, Québec, "Optical Scattering Research at the Center for Process Analytical Chemistry", 2002 (Invited Talk).
- L.W. Burgess, "Future Trends in Analyzer Systems", 14th Int'l Forum on Process Analytical Chemistry, Las Vegas, NV, January 2000 (Plenary Lecture)
- L.W. Burgess and B. Marquardt, "Overview of Research at the Center for Process Analytical Chemistry**,"** Procter and Gamble Pharmaceuticals, Norwich, NY, February 1999
- L.W. Burgess, "Sensors Research at the Center for Process Analytical Chemistry," Goodyear Chemicals Research and Development, Akron, OH. February 1999.
- L.W. Burgess, "Sensors Research at the Center for Process Analytical Chemistry," Akzo Nobel, Dobbs Ferry, NY. September 1998. (Invited Talk).
- L.W. Burgess, "Optical Sensors Research at CPAC," US Analytical Sciences Colloquium, Smith Kline Beecham, Princeton, NJ. September 1998. (Invited Talk) L.W. Burgess, "Optical and Acoustic Sensor Research at CPAC", Dow Chemical, Freeport, TX, September 1997. (Invited Talk).
- L.W. Burgess, D. Kuhns, A. Robinson, and A. Brodsky, "The Viability of Multiple Bubble Sonoluminescence (MBSL) for Analytical Applications, 12th Int'l Forum on Process Analytical Chemistry, Orlando, FL, January 1998 (Invited Talk).
- L.W. Burgess, "Sensors," NIST/NSF Workshop on Process Measurement and Control: Industry Needs, New Orleans, LA March 1998. (Invited Talk).

- L.W. Burgess, "Flow Probe™ Chemical Analyzer Development," IBC's 2nd Annual Int'l. Meeting on Environmental Monitoring Tools for Intrinsic Bioremediation, Annapolis, MD, December 1996, (Invited Talk)
- L.W. Burgess, "Outlook for the Development of On-Line In Situ Tools for Characterization and Monitoring," Workshop on Scientific and Engineering Challenges in Remediation of Contaminated Soil and Groundwater, Seattle, WA, May 1997. (Invited Talk).
- L.W. Burgess, "Optical Sensors for Direct Measurements in Chemical Processes,", 22nd Review of Progress in Quantitative NDE, Seattle, WA, July 1995 (Invited Plenary Speaker)
- L.W. Burgess, "Fiber Optic Based Chemical Sensing," Optical Society of America Annual Meeting, Dallas, TX, October 1994, (Invited Talk)
- L.W. Burgess, "Optical Waveguides for Chemical Analysis," JASON Unclassified Briefing, LaJolla, CA, July 1993, (Invited Talk).
- L.W. Burgess, "Analytical Techniques for Industrial Process Control," ANATEC 94 4th Int'l Symposium, Mandelieu La Napoule, France, April 1994. (Invited Talk and ANATEC Scientific Committee Member).
- L.W. Burgess, "Absorption Based Sensors," Europt(R)ode II, 2nd European Conference on Optical Chemical Sensors & Biosensors, Firenze, Italy, April 1994. (Invited Talk).
- L.W. Burgess, "Absorption Based Sensors," Europt(R)ode II, 2nd European Conference on Optical Chemical Sensors & Biosensors, Firenze, Italy, April 1994. (Invited Talk)

V. Publications: career total [96] in press [1] submitted [1] book chapters, reviews [6]

Last 10 years:

1. P. G. Vahey, S. H. Park, B. J. Marquardt, Y. Xia, L. W. Burgess, and R. E. Synovec, Development of a positive pressure driven micro-fabricated liquid chromatographic analyzer through rapid prototyping with poly(dimethylsiloxane); Optimizing chromatographic efficiency with sub-nanoliter injections, Talanta, vol. 51, 1205-1212, (2000)
2. M. J. Kelly, W. C. Sweatt, S. A. Kemme, K. J. Kasunic, D. S. Blair, S. H. Zaidi, J. R. McNeil, L.W. Burgess, A.M. Brodsky, and S.A. Smith "Grating Light Reflection Spectroscopy for Detection of Trace Amounts of Aromatic Hydrocarbons in Water", Sandia Report, SAND2000-1018, April (2000)
3. S. A. Smith, A. M. Brodsky, P. G. Vahey, and L. W. Burgess, "Nanoparticle Characterization in Nanoliter Volumes by Grating Light Reflection Spectroscopy" Anal.Chem., ., Vol 72, No. 18, 4249 (2000)
4. S. R. Thurber, A. M. Brodsky, and L. W. Burgess, "The Characterization of Random Media by Low Coherence Interferometry", Applied Spectroscopy, Vol. 54, No. 10, (2000).
5. S. A. Smith, A. M. Brodsky, P. G. Vahey, and L.W. Burgess, "Nanoparticle Characterization in Nanoliter Volumes by Grating Light Reflection Spectroscopy" Anal.Chem., Vol 72, No. 18, 4249 (2000)
6. Brodsky A., S. Thurber, L. Burgess, "Low Coherence Interferometry in Random Media I., Theory", J. Opt. Soc. Am. A, Vol. 17, No. 11, 2024 (2000).
7. S. Thurber L. Burgess A. Brodsky P. Shelley, "Low Coherence Interferometry in Random Media II. Experimental," J. Opt. Soc. Am. A, Vol. 17, No. 11, 2034 (2000)
8. A.M. Brodsky, L.W. Burgess and A.L. Robinson "Cooperative effects in multi-bubble sonoluminescence" Ultrasonics, Vol. 39, Issue 2, 97 (2001)
9. T. J. Matula, J. Guan, and L. A. Crum, A. L. Robinson and L. W. Burgess "Near-infrared emissions in single-bubble and multi-bubble sonoluminescence" Phy Rev. E, , Vol. 64, 026310 (2001)
10. Vahey PG, Smith SA, Costin CD, Xia Y, Brodsky A, Burgess LW, Synovec RE, "Toward a fully integrated positive-pressure driven microfabricated liquid analyzer" Anal. Chem. Vol. 74(1):177-84 (2002)
11. S. Tanikkul, J. Jakmunee, M. Rayanakorn, K. Grudpan, B. J. Marquardt, G. M. Gross, B. J. Prazen; L. W. Burgess, G. D. Christian, R. E. Synovec, "Characterization and Use of a Raman Liquid Core Waveguide Sensor Using Preconcentration Principles," Talanta, 59, 809 – 816, (2003)
12. Brodsky, A and L. Burgess "Theoretical Study of the Coherent Backscattering of Light in Disordered Media", J. Modern Physics B, Vol. 47, Number 3, (2003)
13. M. S. Greenwood, A. Brodsky, L. Burgess, L.J. Bond, and M. Hamad, "Ultrasonic Diffraction Grating Spectroscopy and Characterization of Fluids and Slurries," Ultrasonics 42, 531-536 (2004)

14. J. Koschwanez, M. Holl, B. Marquardt, J. Dragavon, L. Burgess, and D. Meldrum, "Identification of budding yeast using a fiber-optic imaging bundle", Rev. of Sci. Instruments, Vol.75, 3, 1363 (2004)
15. M. L. Hamad, S. Kailasam, A. M. Brodsky, R. Han, J. P. Higgins, D. Thomas, R. A. Reed, and L. W. Burgess "Monitoring of a Pharmaceutical Nanomilling Process Using Grating Light Reflection Spectroscopy", Applied Spec. Vol. 59, 1, (2005)
16. S. L. Randall, A. M. Brodsky, and L. W. Burgess "Manifestation of Mie Resonances in Light Scattering from Multiscattering Media", Inter. J. of Mod. Phys B, V. 19, No. 4 (2005)
17. T. J. Strovas, J. M. Dragavon, T. J. Hankins, J. B. Callis, L.W. Burgess, and M. E. Lidstrom, "Measurement of Respiration Rates of Methylobacterium extorquens AM1 Cultures by Use of a Phosphorescence-Based Sensor", Applied and Environmental Microbiology, 72(2):1692–1695 (2006)
18. A.M. Brodsky, G. T. Mitchell, S. L. Ziegler, and L. W. Burgess, "Coherence loss in light backscattering by random media with nanoscale nonuniformities", Phys. Rev. E 75, 046605 (2007)
19. L. W. Burgess, "Grating Light Reflection Spectroscopy: A Tool for Monitoring the Properties of Heterogeneous Matrices", in Micro Instrumentation for High Throughput Experimentation and Process Intensification- a tool for PAT, WILEY-VCH Verlag GmbH & Co. (2007)
20. A.C. Young, J. Dragavon, T. Strovas, T. Molter, L. Zheng, L. W. Burgess, A. K.-Y. Jen, M. E. Lidstrom, D. R. Meldrum, "Two-photon lithography of platinum porphyrin oxygen sensors," IEEE Sensors, vol. 7, issue 6, pp. 931-936, (2007)
21. T. W. Molter, M. R. Holl, J. M. Dragavon, S. C. McQuaide, J. B. Anderson, L. W. Burgess, M. E. Lidstrom, and D. R. Meldrum, "A novel approach for measuring single cell oxygen consumption rates," IEEE Transactions on Automation Science and Engineering, VOL. 5, NO. 1, pp. 32-42 (2008)
22. J. Dragavon, T. Molter A. C. Young, T. Strovas, S. McQuaid, M. Zheng, B. Cookson, A. K.-Y. Jen, M. E. Lidstrom, D. R. Meldrum, L. Burgess, "A Cellular Isolation System for Real-Time Single Cell Oxygen Consumption Monitoring", J. of the Royal Society Interface, 5, S151–S159 (2008) .
23. T. W. Molter, S. C. McQuaide, M. T. Suchorolski, T. J. Strovas, L. W. Burgess, D. R. Meldrum, M. E. Lidstrom, "A microwell array device capable of measuring single-cell oxygen consumption rates" Sensors and Actuators B: Chemical, Vol. 135, 2, pp. 678-686 (2009)
24. G. T. Mitchell, A. B. Brodsky, and L. W. Burgess "Optical Analysis of Nanoscale Nonuniformities using Grating Light Reflection Spectroscopy", Accepted J. Opt. Soc. Am. (2010)
25. T. Oates and L. Burgess "Broadband Absorbance in a Liquid-Core Optical Ring Resonator", submitted to Applied Spectroscopy (2011)

VI. Grant Activity: (2000-present)

HSHQDC-09-C-00131 09/01/2009 - 03/15/2011
DHS (SBIR subcontract w/Enertechnix)) $59,808
Major goals: Develop a particle and vapor collection system for high flow sampling of trace explosives.

Renewal: 1 P50 HG002360-01 8/01/06- 7/31/11
NIH-GRI $974,666
Major goals: same as below.

1 P50 HG002360-01 8/01/01- 7/31/06
NIH-GRI $1,026,853
Major goals: Development of integrated biologically-active microsystems to enable measurements of metabolic processes at the level of a single cell in order to correlate cellular events with genomic information.

DE-FG02-05ER63990 1/15/05- 12/14/07
DOE/EMSP $303,705
Major goals: Physical characterization of solid liquid slurries at high weight fractions utilizing optical and ultrasonic methods. (Renewal of DE-FG07-01ER63267 below)

DE-FG07-01ER63297 9/15/01- extended 9/14/05
DOE/EMSP $188,000
Major goals: Develop ultrasonic diffraction grating spectroscopy and reflection techniques for characterizing waste slurries.

DE-FG07-01ER63267 9/15/01- extended 9/14/05
DOE/EMSP $400,000
Major goals: hysical characterization of solid liquid slurries at highway fractions utilizing optical and ultrasonic methods.

OCE-019999 (subcontract W/ASU) (Burgess) 10/1/01-9/30/06
NSF $1,027,575
Major goals: Develop sensors for in situ analysis of the ecosystem in and around hydrothermal deep-sea vents

63-1058 (CPAC Funding) 7/1/2006-9/30/2010
CPAC $115,037
Major goals: Advanced sensor development for monitoring particle systems.

Misc. CPAC project funding 2001-2006 ~$350,000

VII. Honors and Awards:

Exxon Education Foundation Grant, 1995-1996
Exxon Education Foundation Grant, 1996-1997
R&D 100 Award, for invention of planar waveguide, September 1991

Patents
6,831,745, 14 December, 2004, “Optical Immersion Probe Incorporating a Spherical Lens”
5,502,560, 1996 and 5,610,708, 1997, “Analytical Sensor Using Grating Light Reflection Spectroscopy” 5,434,084, 1995 “Flow Optrode Having Separate Reaction and Detection Chambers”
5,168,156, 1992 "Reflective Evanescent Fiber-Optic Chemical Sensor"
5,082,629, 1992"Thin-Film Spectroscopic Sensor"

VIII. Additional Comments on Research, Teaching, and Service:

Currently I co-supervise one postdoc with Mary Lidstrom within the context of the NIH-MLSC center. In addition I am currently director of the UW portion of that program as of May 2010.

I was heavily involved with The Center for Process Analytical Chemistry as a PI for 25 years beginning with its inception in 1985, and serving on its Industrial Advisory Board until 2006.

Member, MEMS Advisory Committee, Washington Technology Center, 1998–2010

Member, External Advisory Committee, MicroChemLab Program, Sandia National Laboratories, February 1997-2000

EXISTING PROGRAM REVIEW: HEC BOARD SUMMARY
Department of Chemistry
College of Arts and Sciences
University of Washington

Degree titles:
Bachelor of Arts
Bachelor of Science
Masters of Science
Doctor of Philosophy

Year of last review: **1999**
Current date: **August 2011**

Number of instructional faculty, students enrolled, and degrees granted over last three years (Autumn-Summer)

	2007-08	2008-09	2009-10
FTE Instructional Faculty	32.5	34.9	31.8
FTE Graduate Teaching Assistants	99.6	100.0	81.1
Undergraduate Program (B.A./B.S.)			
Headcount of Enrolled Students (Autumn)	1,452	1,486	1,433
Number of Degrees Granted	292	288	323
Graduate Program (PhD)			
Headcount of Enrolled Students (Autumn)	211	201	196
Number of Degrees Granted			
Ph.D.	27	37	30
M.S.	9	12	8

Department of Chemistry
2010-11 Committee Membership

Paul Hopkins – Chair
Philip Reid – Associate Chair, Undergraduate Education
Robert Synovec – Associate Chair, Graduate Education

Academic Personnel	**Mayer**, Andersen, Campbell, Chiu, Gelb, Goldberg, Turecek, Varani
Awards	**Heinekey**, Drobny, Gelb, Turecek
Chair's Advisory	**Hopkins**, Andersen, Campbell, Heinekey, Gelb, Goldberg, Mayer, Reid, Synovec, Turecek, Varani *ex officio*: Pedersen
Diversity	**Dalton**, Goldberg, Rathod, Turecek
Faculty Search	*ex officio*: Quigley
Analytical	**Chiu**, Campbell, Synovec, Turecek
Inorganic	**Gamelin**, Goldberg, Heinekey, Kovacs, Mayer
Organic	**Rathod**, Andersen, Gelb, Michael, Sasaki
Physical	**Ginger**, Campbell, Gamelin, Keller, Reid
Steering	Chiu, Gamelin, Ginger, Rathod
Graduate Education	*ex officio*: [Graduate Program Coordinator]
Admissions & Good Standing	**Synovec**, Drobny, Ginger, Khalil, Kovacs, Li, Maly, Michael, Reinhardt
Applications & Recruiting	**Khalil**, **Li**, **Maly**, Boydston, Chatterjee, Lalic, Masiello, Zhang
Instructional Coordinators	**Hopkins**, Heinekey, Rathod, Reid, Synovec
Laboratory Safety	**Pedersen**, Heinekey, Lalic, Mayer, Michael, Rathod *ex officio*: Harvey, Holm
Research Services	**Turecek**, Gamelin, Kovacs, Robinson, Varani *ex officio*: Pedersen, Gladden, Kaminsky, Paranji, Sadilek
Sophomore Organic Task Force	**Michael**, Lalic, Maly, Raucher, Sasaki
Space	**Chiu**, **Pedersen**, Campbell, Gelb, Kovacs
Undergraduate Education (Classroom and Laboratory)	**Reid**, Drobny, Goldberg, Synovec *ex officio*: Fulmore, Harty, Harvey, Stone

University of Washington
Department of Chemistry
Mission Statement

Chemistry plays a central role in the sciences because the goal of chemical study is to understand natural processes on an atomic and molecular level. Thus, graduating chemistry and biochemistry majors should experience the excitement of relating molecular properties to the order they observe in nature. As teachers, our challenge is to emphasize the connections between the molecular level structure and properties and functions of macroscopic matter.

This mission suggests the following outcomes for our educational process. Following their studies, graduating chemistry and biochemistry majors should have:

- Have a general knowledge of the basic areas of chemistry working knowledge of at least one area. A working knowledge is demonstrated by the ability to apply formal knowledge in a problem-solving environment.

- Have basic proficiency in laboratory skills (e.g., preparing solutions, chemical synthesis techniques, chemical and instrumental analysis and laboratory safety).

- Have the ability to formulate and carry out strategies for solving scientific problems.

- Have an understanding of the principles and applications of modern instrumentation, computation, experimental design, and data analysis.

- Have had the opportunity to gain experience with a research project as part of an upper level course and the opportunity to participate in active, individual laboratory research within the university or in another appropriate setting.

- Have the ability to communicate scientific information clearly and precisely, both orally and in writing.

- Have the ability to read, understand, and use scientific literature.

- Have some awareness of the broader implications of chemical processes (e.g., resource management, economic factors, and ecological considerations).

- Have had the opportunity to work with others as part of a team to solve scientific problems.

- Have had an introduction to the opportunities in, and requirements for, careers available to those with training in chemistry.

Department of Chemistry
Undergraduate Course Descriptions

CHEM 110 Introduction to General Chemistry (3) NW
Introduction to general chemistry with an emphasis on developing problem solving skills. Covers basic concepts of chemistry along with the mathematics required for quantitative problem solving. For students without high school chemistry or with limited mathematics background. Successful completion of CHEM 110 prepares students to enroll in CHEM 142. Credit/no credit only. Offered: A.

CHEM 120 Principles of Chemistry I (5) NW, QSR
First course in a three-quarter overview of chemistry. Not for students majoring in biochemistry, chemistry, or engineering. Includes matter and energy, chemical nomenclature, chemical reactions, stoichiometry, modern atomic theory, chemical bonding. Laboratory. Only 5 credits can be counted toward graduation from the following: CHEM 120, 142, 144, 145. Offered: AS.

CHEM 142 General Chemistry (5) NW,QSR
For science and engineering majors. Atomic nature of matter, stoichiometry, acids and bases, chemical equilibrium, and gas laws. Includes laboratory. Recommended: high school chemistry and placement into MATH 120 or higher. No more than the number of credits indicated can be counted toward graduation from the following course groups: 142, 144, 145 (5 credits). Cannot be taken for credit if CHEM 120 already taken. Offered: AWSpS.

CHEM 144 Advanced General Chemistry (5) NW,QSR
For science and engineering majors. Provides a more in depth presentations of atomic nature of matter, stoichiometry, acids and bases, chemical equilibrium, and gas laws. Lab included. Prerequisite: either MATH 124 or MATH 134, which may be taken concurrently; one year of high school chemistry. No more than the number of credits indicated can be counted towards graduation from the following course groups: CHEM 142, CHEM 144, CHEM 145 (5 credits). Cannot be taken for credit if CHEM 120 already taken. Offered: A.

CHEM 145 Honors General Chemistry (5) NW, QSR
145 and 155 cover material in 142, 152, and 162. Includes laboratory. Prerequisite: either MATH 124 or MATH 134, either of which may be taken concurrently; score of 66% on HCHEMC placement test, score of 4 or 5 on AP Chemistry exam, or IB score of 5, 6, or 7 on high level chemistry exam. No more than the number of credits indicated can be counted toward graduation from the following course groups: 142, 144, 145 (5 credits); 145, 155, 162 (10 credits). Offered: A.

CHEM 152 General Chemistry (5) NW
Energy, enthalpy and thermochemistry, spontaneity, entropy and free energy, electrochemistry, quantum mechanics and atomic theory, general concepts of bonding. Includes laboratory. Prerequisite: a minimum grade of 1.7 in either CHEM 142, CHEM 144, or CHEM 145. No more than the number of credits indicated can be counted toward graduation from the following course groups: 152, 154, 155 (5 credits). Offered: AWSpS.

CHEM 154 Advanced General Chemistry (5) NW,QSR
For science and engineering majors. Provides a more in depth presentation of energy, enthalpy and thermochemistry, spontaneity, entropy and free energy, electrochemistry, quantum mechanics and atomic theory, and general concepts of bonding. Lab included. Prerequisite: either a minimum grade of 3.5 in

CHEM 142, or a minimum grade of 1. 7 in either CHEM 144 or CHEM 145; either MATH 124 or MATH 134; may not be taken for credit if student has completed either CHEM 152 or CHEM 155. No more than the number of credits indicated can be counted towards graduation from the following course groups: CHEM 152, CHEM 154, CHEM 155 (5 credits). Offered: W.

CHEM 155 Honors General Chemistry (5) NW
Continuation of 145. Includes laboratory. Together 145 and 155 cover material in 142, 152, and 162. No more than the number of credits indicated can be counted toward graduation from the following course groups: 152, 154, 155 (5 credits); 145, 155, 162 (10 credits). Prerequisite: 2.2 in CHEM 145. Offered: W.

CHEM 162 General Chemistry (5) NW
Covalent bonding, chemical kinetics, liquids and solids, properties of solutions, the elements in groups 1A-4A, the elements in groups 5A-8A, transition metals and coordination chemistry, and organic chemistry. Includes laboratory. Prerequisite: a minimum grade of 1.7 in either CHEM 152 or CHEM 154. No more than the number of credits indicated can be counted toward graduation from the following course groups: 162, 164, 165 (5 credits). Offered: AWSpS.

CHEM 164 Advanced General Chemistry (5) NW,QSR
For science and engineering majors. Provides a more in depth presentation of covalent bonding, chemical kinetics, liquids and solids, properties of solutions, the elements in groups 1A-4A, the elements in groups 5A-8A, transition metals and coordination chemistry, and organic chemistry. Lab included. Prerequisite: either a minimum grade of 3.5 in CHEM 152, or a minimum grade of 1.7 in either CHEM 154 or CHEM 155; either MATH 124 or MATH 134; may not be taken for credit if student has completed either CHEM 162 or CHEM 165. No more than the number of credits indicated can be counted towards graduation from the following course groups: CHEM 162, CHEM 164, CHEM 165 (5 credits). Offered: Sp.

CHEM 165 Honors General Chemistry (5) NW
Introduction to systematic inorganic chemistry: representative elements, metals, and nonmetals. Includes coordination complexes, geochemistry, and metallurgy. Additional material on environmental applications of basic chemistry presented. Includes laboratory. No more than the number of credits indicated can be counted toward graduation from the following course groups: 162, 164, 165 (5 credits); 165, 312 (5 credits). Prerequisite: 2.2 in CHEM 155. Offered: Sp.

CHEM 190 Freshman Discovery Seminar in Chemistry (5) NW
Introduces incoming freshman to research basics and scholarly inquiry skills used in the study of chemistry.

CHEM 198 Tutorial Study (2, max. 6) NW
Credit/no credit only.

CHEM 199 Special Problems (1-6, max. 6)
Research in chemistry. Credit/no credit only. Offered: AWSpS.

CHEM 220 Principles of Chemistry II (5) NW, QSR
Second course in a three-quarter overview of chemistry. Not for students majoring in biochemistry, chemistry, or engineering. Includes gases/liquids/solids, solutions, acids and bases, equilibrium,

oxidation-reduction, electrochemistry, organic compounds, hydrocarbons, aromaticity, stereochemistry. Prerequisite: a minum grade of 1.7 in either CHEM 120, CHEM 142, or CHEM 144. Offered: W.

CHEM 221 Principles of Chemistry III (5) NW, QSR
Third course in a three-quarter overview of chemistry. Not for students majoring in biochemistry, chemistry, or engineering. Includes alcohols, phenols, ethers, aldehydes, ketones, carboxylic acids, amines, and structural determination. Only 5 credits can be counted toward graduation from the following: CHEM 221, CHEM 223, CHEM 237, CHEM 335. Prerequisite: 1.7 in CHEM 220. Offered: Sp.

CHEM 223 Organic Chemistry -- Short Program (4) NW
First of a two-quarter lecture series in organic chemistry, for those who elect not to complete the CHEM 237, CHEM 238, CHEM 239 sequence. Introduction to structure, nomenclature, properties, and reactions of the main functional families of organic compounds. Stereochemistry and spectroscopy. No more than 5 credits can be counted toward graduation from the following course group: CHEM 221, CHEM 223, CHEM 237, CHEM 335. Prerequisite: a minimum grade of 1.7 in either CHEM 152, CHEM 154, or CHEM 155; recommended: CHEM 162. Offered: AS.

CHEM 224 Organic Chemistry -- Short Program (4) NW
Continuation of CHEM 223. Structure, nomenclature, properties, and reactions of aldehydes, ketones, carboxylic acid derivatives, amines, carbohydrates, lipids, amino acids, peptides, proteins, and nucleic acids. No laboratory accompanies this course, but CHEM 241 laboratory may be taken concurrently. No more than 4 credits can be counted toward graduation from the following course group: CHEM 224, CHEM 239, CHEM 337. Prerequisite: 1.7 in CHEM 223. Offered: WS.

CHEM 237 Organic Chemistry (4) NW
First course for students planning to take three quarters of organic chemistry. Structure, nomenclature, reactions, and synthesis of the main types of organic compounds. No organic laboratory accompanies this course. No more than 5 credits can be counted toward graduation from the following course groups: CHEM 221, CHEM 223, CHEM 237, CHEM 335. Prerequisite: a minimum grade of 1.7 in either CHEM 155, CHEM 162, or CHEM 164. Offered: AWS.

CHEM 238 Organic Chemistry (4) NW
Second course for students planning to take three quarters of organic chemistry. Further discussion of physical properties and transformations of organic molecules, especially aromatic and carbonyl compounds. No more than the number of credits indicated can be counted toward graduation from the following course groups: 238, 336 (4 credits). Prerequisite: either 1.7 in CHEM 237 or 1.7 in CHEM 335. Offered: WSp.

CHEM 239 Organic Chemistry (3) NW
Third course for students planning to take three quarters of organic chemistry. Polyfunctional compounds and natural products, lipids, carbohydrates, amino acids, proteins, and nucleic acids. Includes introduction to membranes, enzyme mechanisms, prosthetic groups, macromolecular conformations and supramolecular architecture. No more than 4 credits can be counted toward graduation from the following course groups: CHEM 224, CHEM 239, CHEM 337. Prerequisite: either 1.7 in CHEM 238 or 1.7 in CHEM 336. Offered: ASpS.

Department of Chemistry
Undergraduate Course Descriptions

CHEM 241 Organic Chemistry Laboratory (3) NW
Introduction to organic laboratory techniques. Preparation of representative compounds. Designed to be taken with 224 or 238. No more than the number of credits indicated can be counted toward graduation from the following course groups: 241, 346 (3 credits). Prerequisite: either 1.7 in CHEM 223, 1.7 in CHEM 237, or 1.7 in CHEM 335; either CHEM 224, CHEM 238 or CHEM 336, any of which may be taken concurrently. Offered: WSpS.

CHEM 242 Organic Chemistry Laboratory (3) NW
Preparations and qualitative organic analysis. Designed to be taken with 239. No more than the number of credits indicated can be counted toward graduation from the following course groups: 242, 347 (3 credits). Prerequisite: either 1.7 in CHEM 224 or CHEM 239 which may be taken concurrently or CHEM 337 which may be taken concurrently; either 1.7 in CHEM 241 or 1.7 in CHEM 346. Offered: ASpS.

CHEM 291 Study Abroad - Chemistry (1-15, max. 15) NW
For student in the UW study abroad program. Content varies and is individually evaluated. Credit does not apply to major degree requirements without departmental approval.

CHEM 299 Special Problems and Report Writing (1-6, max. 6)
Research in chemistry and/or study in the chemical literature. Requires writing a scientific report. Credit/no credit only. Offered: AWSpS.

CHEM 312 Inorganic Chemistry (3) NW
The periodic table: chemistry of representative and transition elements. Aqueous chemistry, solid state chemistry, and everyday aspects of inorganic chemistry emphasized. Not intended for students who have completed 165. No more than the number of credits indicated can be counted toward graduation from the following course groups: 165, 312 (5 credits). Prerequisite: either CHEM 155, CHEM 162, or CHEM 164; either CHEM 224, CHEM 238, or CHEM 336. Offered: AWS.

CHEM 317 Inorganic Chemistry Laboratory (4) NW
Experimental exploration of the periodic table. Techniques of preparation and characterization of inorganic compounds. Handling of air-sensitive materials and gases. Prerequisite: either CHEM 165 or CHEM 312; either CHEM 242 or CHEM 347. Offered: WSp.

CHEM 321 Quantitative Analysis (5) NW
Introduction to chemical analysis, including gravimetric, volumetric, spectrophotometric, and potentiometric analyses. Laboratory computer use included. Prerequisite: either CHEM 155, CHEM 162, or CHEM 164. Offered: AWS.

CHEM 335 Honors Organic Chemistry (4) NW
For chemistry majors and otherwise qualified students planning three or more quarters of organic chemistry. Structure, nomenclature, reactions, and synthesis of organic compounds. Theory and mechanism of organic reactions. Studies of biomolecules. No organic laboratory accompanies this course. No more than 5 credits can be counted toward graduation from the following course groups: 221, 223, 237, 335. Prerequisite: either CHEM 155, CHEM 162, or CHEM 164. Offered: A.

Department of Chemistry
Undergraduate Course Descriptions

CHEM 336 Honors Organic Chemistry (4) NW
For chemistry majors and otherwise qualified students planning three or more quarters of organic chemistry. Structure, nomenclature, reactions, and synthesis of organic compounds. Theory and mechanism of organic reactions. Studies of biomolecules. No more than 4 credits can be counted toward graduation from the following course groups: CHEM 238, CHEM 336. Prerequisite: 2.2 in CHEM 335. Offered: W.

CHEM 337 Honors Organic Chemistry (4) NW
For chemistry majors and otherwise qualified students planning three or more quarters of organic chemistry. Structure, nomenclature, reactions, and synthesis of organic compounds. Theory and mechanism of organic reactions. Studies of biomolecules. Includes introduction to membranes, enzyme mechanisms, prosthetic groups, macromolecular conformations, and supramolecular architecture. No more than 4 credits can be counted toward graduation from the following course groups: CHEM 239, CHEM 337. Prerequisite: 2.2 in CHEM 336. Offered: Sp.

CHEM 346 Organic Chemistry Honors Laboratory (3) NW
To accompany 336. No more than the number of credits indicated can be counted toward graduation from the following course groups: 241, 346 (3 credits). Prerequisite: 1.7 in CHEM 335; CHEM 336 which may be taken concurrently. Offered: W.

CHEM 347 Organic and Qualitative Organic Honors Laboratory (3) NW
Continuation of 346. To accompany 337. No more than the number of credits indicated can be counted toward graduation from the following course groups: 242, 347 (3 credits). Prerequisite: CHEM 337 which may be taken concurrently; 2.2 in CHEM 346. Offered: Sp.

CHEM 399 Undergraduate Research (*, max. 12)
Research in chemistry. Credit/no credit only. Offered: AWSpS.

CHEM 410 Radiochemistry Laboratory (2) NW
Introductory general service course for students planning further work in nuclear or tracer applications. Safety procedures, detection and measurement of nuclear radiation, radiochemical and tracer techniques. Prerequisite: a minimum grade of 1.7 in either CHEM 155, CHEM 162, or CHEM 164; recommended: CHEM 418. Offered: alternate years.

CHEM 416 Transition Metals (3) NW
Survey of selected key topics in the chemistry of the transition metals, including emphasis on the structure, bonding, and reactivity of major classes of compounds. Prerequisite: either CHEM 165 or CHEM 312; either CHEM 453, CHEM 455, or CHEM 475, which may be taken concurrently. Offered: A.

CHEM 417 Organometallic Chemistry (3) NW
Chemistry of the metal-carbon bond for both main group and transition metals. Structure and reactivity with applications to organic synthesis and catalysis. Prerequisite: either CHEM 224, CHEM 239, or CHEM 337; CHEM 416. Offered: W.

CHEM 418 Nuclear Chemistry (3) NW
Natural radioactivity, nuclear systematics and reactions, radioactive decay processes, stellar nucleosynthesis, applications of radioactivity. Prerequisite: either CHEM 453, CHEM 455, or CHEM 475. Offered: alternate years

CHEM 419 Bioinorganic Chemistry (3) NW
Description of transition metal-containing systems found in biology. Structural and electronic properties and reactivity of metalloproteins, metalloenzymes, and metallocofactors. Methods used to probe and model metal sites by spectroscopic and synthetic techniques. Prerequisite: either CHEM 224, CHEM 239, or CHEM 337; CHEM 416. Offered: Sp, even years.

CHEM 426 Instrumental Analysis (3) NW
Introduction to modern instrumental methods of chemical analysis, including chromatography, optical and mass spectroscopy, electrochemistry and flow injection analysis. Basic concepts of transducers, spectrometers, mass analysis, separation sciences, and computerized data acquisition and reduction. Includes laboratory. Prerequisite: CHEM 321. Offered: Sp.

CHEM 428 Bioinstrumental Analysis (3) NW
Modern instrumental methods of bioanalysis of DNA and proteins, including agarose gel electrophoresis, PCR, Sanger sequencing for nucleic acid analysis and ELISA, SDS-PAGE, and LC/MS-MS analysis of proteins. Mass analysis, separation sciences, and bioinformatics tools. Includes laboratory. No credit allowed if BIOC 426 taken. Prerequisite: either BIOC 405 or BIOC 440. Offered: Sp.

CHEM 429 Chemical Separation Techniques (3) NW
Introduction to modern separation techniques such as gas chromatography, high-performance liquid chromatography, electrophoresis, and field flow fractionation. Prerequisite: either CHEM 224, CHEM 239, or CHEM 337; either CHEM 241, CHEM 321, or CHEM 346. Offered: Sp.

CHEM 433 Theoretical Organic Chemistry -- Predictions and Experimental Tests (3) NW
Molecular orbital theory in organic chemistry. Woodward-Hoffmann rules, aromaticity, concerted reactions, photochemical transformations, and reactions of electron-deficient species. Prerequisite: either CHEM 239 or CHEM 337. Offered: alternate years.

CHEM 436 Molecular Enzymology (3) NW
Enzyme structure, function, chemistry and inhibition, including modes of biological catalysis, stereochemistry, enzyme characterization and kinetics, and design and principles of enzyme inhibitors. Also major classes of natural products, their chemistry, biological activity, biosynthesis, physiological role, and ecological significance. Prerequisite: either CHEM 224, CHEM 239, or CHEM 337; recommended: either BIOC 405 or BIOC 440. Offered: alternate years; Sp.

CHEM 452 Physical Chemistry for Biochemists I (3) NW
General equilibrium thermodynamics emphasizing biochemical applications: ligand binding, biological oxidation-reduction reactions, membranes, active transport, colligative properties, and surface tension. No more than the number of credits indicated can be counted toward graduation from the following course groups: 355, 452 (4 credits); 452, 456 (3 credits). Prerequisite: either CHEM 155, CHEM 162, or CHEM 164; either MATH 125 or MATH 134; either PHYS 115 or PHYS 122. Offered: AWS.

CHEM 453 Physical Chemistry for Biochemists II (3) NW
Continuation of 452. Includes transport properties, enzyme kinetics, introduction to quantum mechanics, spectroscopy, and classical statistical mechanics. Prerequisite: either CHEM 452 or CHEM 456; either MATH 126 or MATH 135; either PHYS 116 or PHYS 123. Recommended: MATH 307; MATH 308. Offered: WSp.

CHEM 455 Physical Chemistry (3) NW
Introduction to quantum chemistry and spectroscopy. Theory of quantum mechanics presented at an elementary level and applied to the electronic structure of atoms and molecules and to molecular spectra. Prerequisite: either CHEM 155, CHEM 162, or CHEM 164; either MATH 126 or MATH 136; either PHYS 116 or PHYS 123; recommended: MATH 307; MATH 308. Offered: ASp.

CHEM 456 Physical Chemistry (3) NW
Chemical thermodynamics. Laws of thermodynamics presented with applications to phase equilibria, chemical equilibria, and solutions. No more than the number of credits indicated can be counted toward graduation from the following course groups: 452, 456 (3 credits). Prerequisite: either CHEM 155, CHEM 162, or CHEM 164; either MATH 126 or MATH 136; either PHYS 116 or PHYS 123; recommended: MATH 307. Offered: WS.

CHEM 457 Physical Chemistry (3) NW
Introduction to statistical mechanics, kinetic theory, and chemical kinetics. Prerequisite: either CHEM 455 or CHEM 475; either CHEM E 326 which may be taken concurrently, CHEM 456 or CHEM 476. Offered: Sp.

CHEM 458 Global Atmospheric Chemistry (4) NW
Global atmosphere as chemical system. Physical factors and chemical processes. Natural variabilities and anthropogenic change. Cycling of trace substances. Global issues such as climate change, acidic deposition, influences on biosphere. Prerequisite: either ATM S 358 or CHEM 456. Offered: jointly with ATM S 458.

CHEM 460 Spectroscopic Molecular Identification (3) NW
Basic theory of spectral techniques-infrared and ultraviolet/visible spectroscopy, NMR, and mass spectrometry-with emphasis on spectral interpretation skills needed for the elucidation of structure, conformation, and dynamics in organic and biological chemistry. Prerequisite: either CHEM 224, CHEM 239, or CHEM 337; recommended: either CHEM 455 or CHEM 475. Offered: A.

CHEM 461 Physical Chemistry Laboratory (3) NW
Physical measurements in chemistry. Vacuum techniques, calorimetry, spectroscopic methods, electrical measurements. Prerequisite: either CHEM 453, or both CHEM 455 and CHEM 456, or both CHEM 456 and CHEM 475; recommended CHEM 457. Offered: ASpS.

CHEM 462 Techniques of Synthetic Organic Chemistry (2-3) NW
Laboratory techniques of synthetic organic chemistry. Vacuum distillation, multistep synthesis, air sensitive reagents, photochemistry, chromatography, and separation techniques. Prerequisite: either CHEM 242 or CHEM 347; CHEM 460 which may be taken concurrently. Offered: A.

Department of Chemistry
Undergraduate Course Descriptions

CHEM 463 Spectroscopic Techniques for Structural Identification (2) NW
Laboratory techniques of spectroscopic analysis for structural determination using UV, IR, NMR, mass spectroscopy. Prerequisite: CHEM 460. Offered: W.

CHEM 464 Computers in Data Acquisition and Analysis (3) NW
Introduction to use of the computer in the chemistry laboratory. Principles of microcomputers and their use for such problems as data acquisition, noise reduction, and instrument control. Prerequisite: either CHEM 453, CHEM 455, or CHEM 475; MATH 136, or both MATH 307 and MATH 308. Offered: Sp.

CHEM 465 Computations in Chemistry (3) NW
Computer calculations on color graphics workstations applied to problems in chemistry. Numerical methods and algorithms for calculating classical dynamics, quantum wavefunctions, wavepacket propagation, chemical kinetics. Use of computer programs for calculating electronic wavefunctions, molecular conformations, simulations of liquids and solids. Prerequisite: either CHEM 455 or CHEM 475, either of which may be taken concurrently. Offered: W.

CHEM 475 Honors Physical Chemistry (3) NW
Introduction to quantum chemistry, spectroscopy. Theory of quantum mechanics applied more rigorously than in CHEM 455. Application of quantum mechanics to electronic structure of atoms and molecules. Computer software used to solve problems. Prerequisite: either CHEM 155, CHEM 162, or CHEM 164; either MATH 126 or MATH 136; either PHYS 116 or PHYS 123; recommended: MATH 307; MATH 308. Offered: A.

CHEM 484 Materials Chemistry (3) NW
Overview of basic principles, techniques, and applications associated with solid materials. Topics include description of crystals, examples of crystal structures, structural analysis, band structures of solid materials, preparation of materials, materials for microelectronics, and materials for information technology. Prerequisite: CHEM 453 or CHEM 455. Offered: jointly with MSE 484; A.

CHEM 491 Study Abroad -- Advanced Chemistry (1-15, max. 15) NW
For students in the UW study abroad program. Content varies and is individually evaluated. Credit does not apply to major degree requirements without departmental approval.

CHEM 498 Teaching Chemistry (3) NW
Training in teaching chemistry laboratory and quiz sections. For chemistry and biochemistry majors, especially those planning graduate work or secondary education. Covers teaching strategies, student diversity, learning styles, grading, and interaction with students and faculty. Credit/no credit only. Offered: A.

CHEM 499 Undergraduate Research and Report Writing (*, max. 12)
Research in chemistry and/or study in the chemical literature. Credit/no credit only. Offered: AWSpS.

Bachelor of Science in Chemistry- ACS Certified
Degree Requirements

(For students declaring chemistry as their major Spring quarter 2010 or later)

1) Mathematics (MATH)

a) Calculus or Honors Calculus

Calculus	Honors Calculus
☐ 124 (5 credits)	☐ 134 (5)
☐ 125 (5)	☐ 135 (5)
☐ 126 (5)	☐ 136 (5)

b) Two additional math courses above the 200 level are required if the regular calculus sequence is taken. **Recommended are:**

☐ 307 (3) or ☐ AMATH 351 (3)
☐ 308 (3) or ☐ AMATH 352 (3)

2) Physics (PHYS)

a) Calculus-based or Algebra-based

Calculus-based	Algebra-based
☐ 121 (5)	☐ 114 (4)
☐ 122 (5)	☐ 115 (4)
☐ 123 (5)	☐ 116 (4)

The calculus-based series is recommended.
NOTE: One credit lab is included with each course in the calculus-based physics series.

b) One credit of laboratory
☐ 117, 118, 119 (1)

3) General Chemistry (CHEM)

Regular	Advanced	Honors
☐ 142 (5)	☐ 144 (5)	☐ 145 (5)
☐ 152 (5)	☐ 154 (5)	☐ 155 (5)
☐ 162 (5)	☐ 164 (5)	☐ 165 (5)

4) Analytical Laboratory (CHEM)

☐ 321 Quantitative Analysis (5)
☐ 426 Instrumental Analysis (3)

5) Inorganic Chemistry (CHEM)

☐ 312 Lecture (3)
☐ 317 Laboratory (4)
☐ 416 Transition Metals Lecture (3)

Students completing 155 and 165 are exempt from CHEM 312.

6) Organic Chemistry (CHEM)

a) Regular or Honors

Regular	Honors
☐ 237 (4)	☐ 335 (4)
☐ 238* (4)	☐ 336 (4)
☐ 239 (3)	☐ 337 (4)

b) Laboratory

☐ 241 (3)	☐ 346 (3)
☐ 242 (3)	☐ 347 (3)

*Organic laboratory begins with 2nd organic lecture.

7) Physical Chemistry (CHEM)

☐ 455 (3)
☐ 456 (3)
☐ 457 (3)
☐ 461 (3)

8) Biochemistry (BIOC)

☐ 405 (3) *

9) Advanced Chemistry

The two parts of this requirement must total a minimum of **5 credits**:

a) ☐ Choose one 400 level lab from the following:

___ 462 Organic Synthesis (2 or 3)

___ 463 Spectroscopy (2)

___ 465 Computations in Chemistry (3)

b) ☐ Additional 400-level CHEM/BIOC courses (**EXCEPT** CHEM 498), not previously mentioned, taken for a numerical grade.

_____

_____

Honors students only may apply Chem 399 or 499 for Part B.

Students should contact chemistry advising regarding prerequisite alternatives for BIOC 405.

Bachelor of Science in Chemistry
Degree Requirements

(For students declaring chemistry as their major Spring Quarter 2010 or later)

1) Mathematics (MATH)

a) Regular or Honors

Regular	Honors
☐ 124 (5)	☐ 134 (5)
☐ 125 (5)	☐ 135 (5)
☐ 126 (5)	☐ 136 (5)

b) Additional Math – one approved 300 level or higher. Recommended:
☐ 308 (3) or ☐ AMATH 352
Students who have taken the Honors 134, 135, 136 sequence are exempt from this additional math requirement.

2) Physics (PHYS)

a) Calculus-based or Algebra-based

Calculus-based	Algebra-based
☐ 121 (5)	☐ 114 (4)
☐ 122 (5)	☐ 115 (4)
☐ 123 (5)	☐ 116 (4)

The calculus-based series is recommended.
NOTE: One credit lab is included with each course in the calculus-based physics series.

b) One credit of laboratory
☐ 117, 118, 119 (1)

3) General Chemistry (CHEM)

Regular	or Advanced	or Honors
☐ 142 (5)	☐ 144 (5)	☐ 145 (5)
☐ 152 (5)	☐ 154 (5)	☐ 155 (5)
☐ 162 (5)	☐ 164 (5)	☐ 165 (5)

4) Inorganic Chemistry (CHEM)

☐ 312 Lecture (3)
for students who took 142-152-162

or

☐ 416 Transition Metals Lecture (3)
for students who took 145-155-165

5) Organic Chemistry (CHEM)

a) Lecture

Regular	or	Honors
☐ 237 (4)		☐ 335 (4)
☐ 238 (4)		☐ 336 (4)
☐ 239 (3)		☐ 337 (4)

b) Laboratory
☐ 241 (3) or ☐ 346 (3)
Organic laboratory begins with the second lecture course.

6) Physical Chemistry (CHEM)

Regular
☐ 455 (3)
☐ 456 (3)
☐ 457 (3)

7) Chemistry Labs (CHEM)

a) ☐ **two of the three** labs: Chem 317(4), 321 (5), and 461(3)
b) ☐ **five** additional credits from the following:
CHEM 242(3), 317(4), 321(5), 347(3), 426 (3), 461(3), 462(2 or 3), 463(2), 465(3), or BIOC 426(4).

8) Science Electives (11 credits)

- 400 level **CHEM/BIOC** lecture or lab courses (**EXCEPT** CHEM 498)
- Students who have a chemistry grade point average of 3.3 can apply up to six credits of CHEM 399 or 499 research
- Math 307 or AMATH 351 recommended

_____

_____

Note: This sheet outlines the degree requirements for the non-ACS certified chemistry degree. An ACS-Certified degree is described in a separate worksheet. For more information see the website: http://depts.washington.edu/chemugs/degree_req.html or e-mail advisers@chem.washington.edu.

Bachelor of Arts in Chemistry
Degree Requirements

(For students declaring chemistry as their major Spring Quarter 2002 or later)

1) Mathematics (MATH)

Regular	or	Honors Calculus
☐ 124 (5)		☐ 134 (5)
☐ 125 (5)		☐ 135 (5)
☐ 126 (5)		☐ 136 (5)

2) Physics (PHYS)

Calculus-based	or	Algebra-based
☐ 121 (5)		☐ 114 (4)
☐ 122 (5)		☐ 115 (4)
☐ 123 (5)		☐ 116 (4)

The calculus-based series is recommended.
NOTE: One credit lab is included with each course in the calculus–based physics.
If algebra-based physics taken, students must take one lab from below.

One quarter of physics laboratory
☐ 117, 118, 119 (1)

3) General Chemistry (CHEM)

Regular	or	Advanced	or	Honors
☐ 142 (5)		☐144 (5)		☐ 145 (5)
☐ 152 (5)		☐154 (5)		☐ 155 (5)
☐ 162 (5)		☐164 (5)		☐ 165 (5)

4) Organic Chemistry (CHEM)

a) Regular or Honors

☐ 237 (4)		☐ 335 (4)
☐ 238 (4)		☐ 336 (4)
☐ 239 (3)		☐ 337 (4)

b) Laboratory

☐ 241 (3)	or	☐ 346 (3)
☐ 242 (3)		☐ 347 (3)

5) Inorganic Chemistry (CHEM)

☐ 312 Lecture (3)

6) Analytical Lab (CHEM)

☐ 321 (5) Quantitative Analysis (5)

7) Advanced Chemistry (CHEM)

Eleven credits of numerically graded CHEM 400 level courses to include either:

a) ☐ 455 (3) or ☐ 452 (3)
☐ 456 (3) ☐ 453 (3)
☐ 457 (3)

b) ☐ Additional 400-level chemistry courses, not previously mentioned, taken for a numerical grade. The two parts of this requirement must total eleven credits.

_____

_____

8) Advanced Chem Lab (CHEM)

☐ CHEM 317 (4) Inorganic Chem Lab or 461(3) Physical Chemistry Lab

Department of Chemistry
Minor Requirements

1) Mathematics

Choose either:

❑ Math 124 (5)

or

❑ Q Sci 291 & 292 (5,5)

2) Physics

Choose either:

❑ 114 (4)

or

❑ 121 (5)

3) General and Organic Chemistry

Choose one sequence as listed

❑ 142, 152, 162, and one of 223, 237 or 335 [5,5,6, (4,4, or 4)]

❑ 145, 155, 165, and one of 223, 237 or 335 [5,5,5, (4,4, or 4)]

Students must complete 3 out of the 4 following groups:

4) Inorganic Chemistry

❑ 312 (3) (Students who complete 165 are exempt from 312 and satisfy this requirement)

5) Analytical Chemistry

❑ 321 (5)

6) Physical Chemistry

Choose one:

❑ 452 (3)

❑ 455 (3)

❑ 456 (3)

7) Organic Chemistry

Choose one:

❑ 224 (4)

❑ 238 (4)

❑ 336 (4)

The Chemistry Minor requires a minimum cumulative GPA of 2.0 and a minimum grade of 1.7 for all courses required for the minor. A minimum of 15 credits taken for the minor must be completed in residence at the University of Washington. Please contact a department adviser in 109 Bagley, 206-543-9343 or 206-616-9880, advisers@chem.washington.edu for more information

Bachelor of Science in Biochemistry
Degree Requirements
(For students declaring biochemistry as their major spring quarter 2010 or later)

1) Mathematics

Regular	or	Honors
☐ 124 (5)		☐ 134 (5)
☐ 125 (5)		☐ 135 (5)
☐ 126 (5)		☐ 136 (5)

2) Physics

Calculus-based	or	Algebra-based
☐ 121 (5)		☐ 114 (4)
☐ 122 (5)		☐ 115 (4)
☐ 123 (5)		☐ 116 (4)

The calculus-based series is recommended.

3) General Chemistry

Regular	or Advanced	or Honors
☐ 142 (5)	☐ 144 (5)	☐ 145 (5)
☐ 152 (5)	☐ 154 (5)	☐ 155 (5)
☐ 162 (5)	☐ 164 (5)	☐ 165 (5)

4) Organic Chemistry

Regular	or	Honors
☐ 237 (4)		☐ 335 (4)
☐ 238 (4)		☐ 336 (4)
☐ 239 (3)		☐ 337 (4)
Laboratory		
☐ 241 (3)		☐ 346 (3)
☐ 242 (3)		☐ 347 (3)

Organic laboratory begins with the second lecture course.

5) Biology

☐ 180 (5)
☐ 200 (5)

6) Biochemistry

☐ 440 (4)
☐ 441 (4)
☐ 442 (4)
☐ 426 Laboratory (4)
(Students may petition research experience be used for exemption from Bioc 426 lab. Consult advisers.)

7) Genome Science

☐ Genome 371 (5)

8) Physical Chemistry

Pchem for Biochemists	or	Regular
☐ 452 (3)		☐ 455 (3)
☐ 453 (3)		☐ 456 (3)
		☐ 457 (3)

9) Science Electives

Eleven credits from courses on the following list are required.

☐ AMATH 351 (3)*	☐ CHEM 458 (3)
☐ AMATH 352 (3)*	☐ CHEM 460 (3)
☐ AMATH 410 (3)	☐ CHEM 461 (3)
☐ BIOL 220 (5)	☐ CHEM 462 (2 or 3)
☐ BIOL 401 (5)	☐ CHEM 463 (2)
☐ BIOL 402 (3)	☐ CHEM 465 (3)
☐ BIOL 411 (4)	☐ GENOME 372 (5)
☐ BIOL 412 (3)	☐ GENOME 373 (5)
☐ CHEM 312 (3)	☐ GENOME 411 (5)
☐ CHEM 317 (4)	☐ IMMUN 441 (4)
☐ CHEM 321 (5)	☐ MATH 307 (3)*
☐ CHEM 410 (2)	☐ MATH 308 (3)*
☐ CHEM 416 (3)	☐ MICROM 402 (3)
☐ CHEM 417 (3)	☐ MICROM 410 (3)
☐ CHEM 418 (3)	☐ MICROM 411 (5)
☐ CHEM 419 (3)	☐ MICROM 412 (3)
☐ CHEM 426 (3)	☐ MICROM 431 (3)
☐ CHEM 429 (3)	☐ NBIO 404 (3)
☐ CHEM 436 (3)	☐ OCEAN 400 (4)

- Up to 9 credits of advanced undergraduate research may count toward this requirement. Research conducted outside Chemistry or Biochemistry must first be approved by one of the undergraduate advisers.
- Additional 400 level science courses may be considered for science electives after consultation and a petition is submitted to the biochemistry advisers.
- *Credit not allowed for both Math 307 and Amath 351 or for both Math 308 and Amath 352 toward science elective requirement.

Bachelor of Arts in Biochemistry
Degree Requirements

1) Mathematics (MATH)

Regular	or	Honors Calculus
☐ 124 (5)		☐ 134 (5)
☐ 125 (5)		☐ 135 (5)
☐ 126 (5)		☐ 136 (5)

2) General Chemistry (CHEM)

Regular	or	Advanced	or	Honors
☐ 142 (5)		☐144 (5)		☐ 145 (5)
☐ 152 (5)		☐154 (5)		☐ 155 (5)
☐ 162 (5)		☐164 (5)		☐ 165 (5)

3) Organic Chemistry (CHEM)

Regular	or	Honors
☐ 237 (4)		☐ 335 (4)
☐ 238 (4)		☐ 336 (4)
☐ 239 (3)		☐ 337 (4)
Laboratory		
☐ 241 (3)		☐ 346 (3)
☐ 242 (3)		☐ 347 (3)

4) Biology (BIOL)

☐ 180 (5)
☐ 200 (5)

5) Physics (PHYS)

Calculus-based	or	Algebra-based
☐ 121 (5)		☐ 114 (4)
☐ 122 (5)		☐ 115 (4)
☐ 123 (5)		☐ 116 (4)

The calculus-based series is recommended. Students taking the calculus based course can apply one credit toward the science elective requirement. Students taking the algebra-based course may count one credit of physics lab (Phys 117, 118, 119) as a science elective.

6) Biochemistry (BIOC)

☐ 405 (3)
☐ 406 (3)

7) Physical Chemistry (CHEM)

☐ 452 (3)
☐ 453 (3)

8) Science Electives

Nine credits from courses on the following list are required.

☐ Amath 351 (3)*
☐ Amath 352 (3)*
☐ Biol 220 (5)
☐ Chem 312 (3)
☐ Chem 317 (4)
☐ Chem 321 (5)
☐ Chem 410 (2)
☐ Chem 416 (3)
☐ Chem 417 (3)
☐ Chem 418 (3)
☐ Chem 419 (3)
☐ Chem 426 (3)
☐ Chem 428 (3)
☐ Chem 429 (3)
☐ Chem 436 (3)
☐ Chem 460 (3)
☐ Chem 461 (3)
☐ Chem 462 (2 or 3)
☐ Chem 463 (2)
☐ Chem 464 (3)
☐ Chem 465 (3)
☐ Genome 371 (5)
☐ Immun 441 (4)
☐ Math 307 (3)*
☐ Math 308 (3)*
☐ MHE 411 (3)
☐ Microm 402 (3)
☐ Microm 410 (3)
☐ Microm 411 (5)
☐ Phys Lab (1)**

- *Limit of 3 credits allowed from specified Math & Amath courses.
- ** 1 credit of Physics Lab may count as a science elective. This includes Phys 117, 118, 119, 121, 122, 123.
- Up to 3 credits of advanced undergraduate research may count toward this requirement. Research conducted outside Chemistry or Biochemistry must first be approved by one of the biochemistry advisers.
- Additional 400 level science courses may be considered for science electives after consultation and a petition is submitted to the biochemistry advisers.

Department Ratings Summary

	Chemistry			Natural Sciences			University of Washington		
	No. of Classes	Mean (SD)	*Adjusted Mean (SD)*	No. of Classes	Mean (SD)	*Adjusted Mean (SD)*	No. of Classes	Mean (SD)	*Adjusted Mean (SD)*
Course as a whole was:									0 = Very Poor, 5 = Excellent
Lower level, Faculty	134	3.7 (0.68)	*4.0 (0.61)*	556	3.7 (0.57)	*4.0 (0.56)*	1,994	4.0 (0.59)	*4.0 (0.54)*
Lower level, TAs	124	3.7 (0.61)	*3.9 (0.58)*	719	3.7 (0.58)	*3.8 (0.56)*	2,531	3.9 (0.60)	*3.9 (0.55)*
Upper level	60	4.0 (0.53)	*4.0 (0.50)*	716	4.0 (0.57)	*4.0 (0.54)*	4,137	4.1 (0.58)	*4.0 (0.53)*
Graduate level	12	4.0 (0.88)	*4.0 (0.84)*	318	4.2 (0.61)	*4.1 (0.58)*	2,396	4.1 (0.65)	*4.1 (0.60)*
TOTAL	330	3.8 (0.65)	*4.0 (0.59)*	2,309	3.9 (0.61)	*4.0 (0.56)*	11,058	4.0 (0.61)	*4.0 (0.55)*
Instructor's effectiveness in teaching the subject matter was:									0 = Very Poor, 5 = Excellent
Lower level, Faculty	134	3.7 (0.87)	*4.0 (0.82)*	556	3.9 (0.74)	*4.1 (0.72)*	1,994	4.1 (0.68)	*4.1 (0.64)*
Lower level, TAs	124	3.8 (0.67)	*4.0 (0.65)*	719	3.8 (0.72)	*3.9 (0.70)*	2,531	4.0 (0.68)	*4.0 (0.64)*
Upper level	60	4.1 (0.68)	*4.2 (0.67)*	717	4.1 (0.66)	*4.2 (0.63)*	4,136	4.2 (0.65)	*4.1 (0.60)*
Graduate level	12	4.0 (1.10)	*4.1 (1.05)*	318	4.3 (0.65)	*4.2 (0.64)*	2,397	4.2 (0.71)	*4.1 (0.68)*
TOTAL	330	3.8 (0.79)	*4.0 (0.74)*	2,310	4.0 (0.72)	*4.1 (0.69)*	11,058	4.1 (0.68)	*4.1 (0.64)*
COMBINED ITEMS 1-4:									0 = Very Poor, 5 = Excellent
Lower level, Faculty	134	3.7 (0.71)	*4.0 (0.66)*	556	3.8 (0.60)	*4.1 (0.59)*	1,994	4.1 (0.59)	*4.1 (0.55)*
Lower level, TAs	124	3.8 (0.60)	*4.0 (0.58)*	719	3.8 (0.61)	*3.9 (0.57)*	2,531	4.0 (0.60)	*4.0 (0.55)*
Upper level	60	4.1 (0.56)	*4.1 (0.54)*	717	4.1 (0.57)	*4.1 (0.54)*	4,138	4.2 (0.57)	*4.1 (0.52)*
Graduate level	12	4.1 (0.87)	*4.2 (0.84)*	318	4.3 (0.58)	*4.2 (0.57)*	2,400	4.2 (0.63)	*4.1 (0.59)*
TOTAL	330	3.8 (0.67)	*4.0 (0.62)*	2,310	4.0 (0.62)	*4.0 (0.58)*	11,063	4.1 (0.60)	*4.1 (0.55)*
Expected grade relative to other courses you have taken:									1 = Much Lower, 7 = Much Higher
Lower level, Faculty	134	4.3 (0.55)		542	4.6 (0.59)		1,955	4.9 (0.68)	
Lower level, TAs	124	4.3 (0.54)		697	4.6 (0.58)		2,488	4.9 (0.64)	
Upper level	60	4.6 (0.62)		715	4.7 (0.64)		4,011	4.9 (0.64)	
Graduate level	12	4.3 (0.56)		244	4.5 (0.63)		2,244	4.8 (0.65)	
TOTAL	330	4.3 (0.57)		2,198	4.6 (0.61)		10,698	4.9 (0.65)	
Amount of effort to succeed relative to other courses you have taken:									1 = Much Lower, 7 = Much Higher
Lower level, Faculty	134	5.8 (0.52)		541	5.4 (0.65)		1,955	5.2 (0.68)	
Lower level, TAs	124	5.9 (0.54)		696	5.4 (0.65)		2,487	5.2 (0.62)	
Upper level	60	5.5 (0.77)		716	5.3 (0.68)		4,011	5.3 (0.69)	
Graduate level	12	5.4 (0.63)		246	5.1 (0.87)		2,250	5.2 (0.80)	
TOTAL	330	5.8 (0.60)		2,199	5.4 (0.70)		10,703	5.2 (0.70)	
Hours spent per week per credit, including class sessions:									
Lower level, Faculty	134	2.3 (0.52)		541	2.0 (0.81)		1,947	1.8 (0.74)	
Lower level, TAs	124	2.2 (0.66)		687	1.9 (0.88)		2,382	1.7 (0.72)	
Upper level	60	3.6 (1.47)		702	2.3 (0.91)		3,982	2.1 (0.93)	
Graduate level	12	3.0 (0.95)		246	2.4 (1.47)		2,248	2.5 (1.30)	
TOTAL	330	2.5 (0.97)		2,176	2.1 (0.98)		10,559	2.0 (0.99)	
Grade expected in this course:									0.00 to 4.00
Lower level, Faculty	134	3.1 (0.22)		515	3.3 (0.23)		1,918	3.4 (0.24)	
Lower level, TAs	123	3.1 (0.25)		650	3.3 (0.25)		2,440	3.4 (0.23)	
Upper level	59	3.3 (0.20)		699	3.4 (0.21)		3,921	3.5 (0.21)	
Graduate level	12	3.5 (0.18)		194	3.6 (0.23)		1,932	3.6 (0.20)	
TOTAL	328	3.2 (0.24)		2,058	3.3 (0.26)		10,211	3.5 (0.24)	

Statistics for Dept. of Chemistry Exit Survey 2010

Total submissions: 131

** Calculated using numeric values*

Multiple choice - one answer (menu)
Question

I have acquired a general knowledge of the basic areas of chemistry (inorganic, organic, physical, analytical, and biochemistry).

Total responses (N): 131 Did not respond: 0

Numeric value	*Answer*	*Frequency*	*Percentage*
1	Strongly Agree	96	73.28%
2	Somewhat Agree	33	25.19%
3	Somewhat Disagree	2	1.53%
4	Strongly Disagree	0	0.00%

	*Response statistics**
Mean	1.28
Median	1.00
Mode	1
Min/Max	1/3
Standard deviation	0.48

Multiple choice - one answer (menu)
Question

I have gained proficiency in basic laboratory skills such as preparing solutions, performing chemical synthesis, using analytical instruments, and laboratory safety

Total responses (N): 131 Did not respond: 0

Numeric value	*Answer*	*Frequency*	*Percentage*
1	Strongly Agree	85	64.89%
2	Somewhat Agree	40	30.53%
3	Somewhat Disagree	4	3.05%
4	Strongly Disagree	2	1.53%

	*Response statistics**
Mean	1.41
Median	1.00
Mode	1
Min/Max	1/4
Standard deviation	0.63

Multiple choice - one answer (menu)
Question

I can design an experiment and analyze the data I collect.

Total responses (N): 131 Did not respond: 0

Numeric value	*Answer*	*Frequency*	*Percentage*
1	Strongly Agree	67	51.15%
2	Somewhat Agree	56	42.75%
3	Somewhat Disagree	7	5.34%
4	Strongly Disagree	1	0.76%

	*Response statistics**
Mean	1.56
Median	1.00
Mode	1
Min/Max	1/4
Standard deviation	0.63

Multiple choice - one answer (menu)
Question

I have the ability to formulate and solve scientific problems.

Total responses (N): 131 Did not respond: 0

Numeric value	Answer	Frequency	Percentage
1	Strongly Agree	81	61.83%
2	Somewhat Agree	48	36.64%
3	Somewhat Disagree	2	1.53%
4	Strongly Disagree	0	0.00%

Response statistics*	
Mean	1.40
Median	1.00
Mode	1
Min/Max	1/3
Standard deviation	0.52

Multiple choice - one answer (menu)
Question

I have a working understanding of the principles and applications of modern instrumentation and computation.

Total responses (N): 130 Did not respond: 1

Numeric value	Answer	Frequency	Percentage
1	Strongly Agree	50	38.46%
2	Somewhat Agree	65	50.00%
3	Somewhat Disagree	12	9.23%
4	Strongly Disagree	3	2.31%

Response statistics*	
Mean	1.75
Median	2.00
Mode	2
Min/Max	1/4
Standard deviation	0.72

Multiple choice - one answer (menu)
Question

I can communicate scientific information clearly and precisely.

Total responses (N): 129 Did not respond: 2

Numeric value	Answer	Frequency	Percentage
1	Strongly Agree	69	53.49%
2	Somewhat Agree	53	41.09%
3	Somewhat Disagree	7	5.43%
4	Strongly Disagree	0	0.00%

Response statistics*	
Mean	1.52
Median	1.00
Mode	1
Min/Max	1/3
Standard deviation	0.60

Multiple choice - one answer (menu)
Question

I am able to locate, read, and understand scientific literature.

Total responses (N): 131 Did not respond: 0

Numeric value	Answer	Frequency	Percentage

Response statistics*	
Mean	1.45
Median	1.00
Mode	1
Min/Max	1/4
Standard deviation	0.64

1	Strongly Agree	81	61.83%
2	Somewhat Agree	42	32.06%
3	Somewhat Disagree	7	5.34%
4	Strongly Disagree	1	0.76%

Multiple choice - one answer (menu)
Question

During the course of my studies, I had the opportunity to explore the broader impications of chemistry on society.

Total responses (N): 130 Did not respond: 1

Numeric value	*Answer*	*Frequency*	*Percentage*
1	Strongly Agree	45	34.62%
2	Somewhat Agree	53	40.77%
3	Somewhat Disagree	27	20.77%
4	Strongly Disagree	5	3.85%

	*Response statistics**
Mean	1.94
Median	2.00
Mode	2
Min/Max	1/4
Standard deviation	0.84

Multiple choice - one answer (menu)
Question

I performed undergraduate research as part of my studies.

Total responses (N): 131 Did not respond: 0

Numeric value	*Answer*	*Frequency*	*Percentage*
1	Yes	84	64.12%
2	No	47	35.88%

	*Response statistics**
Mean	1.36
Median	1.00
Mode	1
Min/Max	1/2
Standard deviation	0.48

Multiple choice - one answer (menu)
Question

If you answered "yes" to the previous question regarding undergraduate research, how much time did you participate in research?

Total responses (N): 131 Did not respond: 0

Numeric value	*Answer*	*Frequency*	*Percentage*
1	one quarter or less	51	38.93%
2	two quarters	8	6.11%
3	three quarters	11	8.40%
4	more than three quarters	61	46.56%

	*Response statistics**
Mean	2.63
Median	3.00
Mode	4
Min/Max	1/4
Standard deviation	1.40

Multiple choice - one answer (menu)
Question

*Response statistics**

If you performed undergraduate research, in what setting was this reserach performed?

Total responses (N): 131 Did not respond: 0

Numeric value	Answer	Frequency	Percentage
1	In the laboratory of a faculty member in Chemistry	77	58.78%
2	In the laboratory of a faculty member outside of Chemistry	46	35.11%
3	In a summer research program at the UW	0	0.00%
4	In a summer research program outside the UW	0	0.00%
5	In industry	2	1.53%
6	other	6	4.58%

Mean	1.64
Median	1.00
Mode	1
Min/Max	1/6
Standard deviation	1.16

Multiple choice - one answer (menu)
Question

Compared to my colleagues receiving degrees from other departments, the preparation I received in my chosen field was:

Total responses (N): 131 Did not respond: 0

Numeric value	Answer	Frequency	Percentage
1	Much Better	33	25.19%
2	Somewhat Better	39	29.77%
3	Equivalent	49	37.40%
4	Somewhat Worse	8	6.11%
5	Much Worse	2	1.53%

	Response statistics*
Mean	2.29
Median	2.00
Mode	3
Min/Max	1/5
Standard deviation	0.96

Multiple choice - one answer (menu)
Question

What are your immediate plans after graduation?

Total responses (N): 130 Did not respond: 1

Numeric value	Answer	Frequency	Percentage
1	Graduate school in chemistry or biochemistry	17	13.08%
2	Professional school (medicine, dental, etc,)	45	34.62%
3	Law school	2	1.54%
4	Pursue another degree	9	6.92%

	Response statistics*
Mean	3.98
Median	4.00
Mode	2
Min/Max	1/8
Standard deviation	2.49

5	Industry	26	20.00%
6	Elementary/Secondary education	3	2.31%
7	Travel/International program (Peace Corps, etc.)	3	2.31%
8	Other	25	19.23%

Long response
Question

What was the best experience you had as a chemistry/biochemistry student?

Total responses (N): 94 Did not respond: 37

Statistics are not calculated for this question type.

Long response
Question

What was the worst experience you had during your studies? What could have been done so that this experience did not occur?

Total responses (N): 81 Did not respond: 50

Statistics are not calculated for this question type.

Multiple choice - one answer (menu)
Question

On average, how were your interactions with the teaching assistants?

Total responses (N): 130 Did not respond: 1

Numeric value	*Answer*	*Frequency*	*Percentage*
1	Very Positive	57	43.85%
2	Somewhat Positive	64	49.23%
3	Somewhat Negative	4	3.08%
4	Very Negative	2	1.54%
5	No Interaction	3	2.31%

	*Response statistics**
Mean	1.69
Median	2.00
Mode	2
Min/Max	1/5
Standard deviation	0.81

Multiple choice - one answer (menu)
Question

On average, how were your interactions with the faculty?

Total responses (N): 130 Did not respond: 1

Numeric value	*Answer*	*Frequency*	*Percentage*
1	Very Positive	41	31.54%

	*Response statistics**
Mean	2.04
Median	2.00
Mode	2
Min/Max	1/5
Standard deviation	1.05

2	Somewhat Positive	63	48.46%
3	Somewhat Negative	14	10.77%
4	Very Negative	4	3.08%
5	No Interaction	8	6.15%

Multiple choice - one answer (menu)
Question

On average, how were your interactions with the undergraduate services staff (laboratory support, undergraduate services office, and stockroom)?

Total responses (N): 131 Did not respond: 0

Numeric value	*Answer*	*Frequency*	*Percentage*
1	Very Positive	65	49.62%
2	Somewhat Positive	50	38.17%
3	Somewhat Negative	4	3.05%
4	Very Negative	1	0.76%
5	No Interaction	11	8.40%

	*Response statistics**
Mean	1.80
Median	2.00
Mode	1
Min/Max	1/5
Standard deviation	1.13

Multiple choice - one answer (menu)
Question

On average, how were your interactions with the academic advising staff?

Total responses (N): 131 Did not respond: 0

Numeric value	*Answer*	*Frequency*	*Percentage*
1	Very Positive	93	70.99%
2	Somewhat Positive	26	19.85%
3	Somewhat Negative	9	6.87%
4	Very Negative	2	1.53%
5	No Interaction	1	0.76%

	*Response statistics**
Mean	1.41
Median	1.00
Mode	1
Min/Max	1/5
Standard deviation	0.75

Long response
Question

Is there anything you would like to communicate to the department? If so, please feel free to provide your comments here.

Total responses (N): 47 Did not respond: 84

Statistics are not calculated for this question type.

Department of Chemistry
Selected Undergraduate Award Winners 2000-2011

Name	Type	Award
Andrew Ishizuka	Astronaut	Astronaut Scholar
Pavan Vaswani	national	Astronaut Scholar
Anna Schneider	national	Barry M. Goldwater Scholarship
Cynthia Fisher	National	Barry M. Goldwater Scholarship
Devon Chandler-Brown	National	Barry M. Goldwater Scholarship
Janice Kim	National	Barry M. Goldwater Scholarship
Jared Silvia	National	Barry M. Goldwater Scholarship
Lesley Everett	national	Barry M. Goldwater Scholarship
Noah Horwitz	National	Barry M. Goldwater Scholarship
Pavan Vaswani	national	Barry M. Goldwater Scholarship
Sean Hughes	national	Barry M. Goldwater Scholarship
Ahmad Moayedpardazi	UW honors	Bonderman Travel Fellowship
August Flanagan	UW honors	Bonderman Travel Fellowship
Rula Green Gladden	UW honors	Bonderman Travel Fellowship
Spencer James	UW honors	Bonderman Travel Fellowship
Matthew Van Wingerden	college	Arts & Sciences Undergraduate Research Award
Noah Horwitz	college	Arts & Sciences Undergraduate Research Award
Robert Snoeberger III	college	Arts & Sciences Undergraduate Research Award
Rudy Sharar	college	Arts & Sciences Undergraduate Research Award
Jared Silvia	college	Dean's Medal, Natural Sciences
Pavan Vaswani	college	Dean's Medal, Natural Sciences
Sean Hughes	college	Dean's Medal, Natural Sciences
Lesley Everett	national	Gates Cambridge Scholarship
Minh-An Nguyen	UW	Junior Medal for High Scholarship
Pavan Vaswani	UW	Junior Medal for High Scholarship
Sariah Khormaee	national	Marshall Scholarship
June Peng	UW	President's Medalist
Minh-An Nguyen	UW	President's Medalist
Pavan Vaswani	UW	President's Medalist
Sariah Khormaee	UW	President's Medalist
Kwun Wah Wen		Ronald E. McNair Presidential Scholar
Pavan Vaswani	UW	Sophomore Medal for High Scholarship
David Moilanen	UW	Sophomore Medal for High Scholarship
Alexandra Herndon	National	United Negro College Fund Merck Fellowship
Jared Silvia	national	Winston Churchill Scholarship