SCHOOL OF PHARMACY

UNIVERSITY *of* WASHINGTON

Thomas A. Baillie, Dean

Graduate Program Review and Self-Study

Department of Medicinal Chemistry:
Doctor of Philosophy Degree in Pharmaceutical Sciences

Department of Pharmaceutics:
Master of Science and Doctor of Philosophy Degrees in Pharmaceutical Sciences

Department of Pharmacy, Pharmaceutical Outcomes Research and Policy Program:
Master of Science and Doctor of Philosophy Degrees in Pharmaceutical Sciences

Department of Pharmacy:
Master of Science in Biomedical Regulatory Affairs

Programs last reviewed in April 2001

November 1, 2009

Stanley S. Weber, Associate Dean
Self-Study Coordinator

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Table of Contents

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Executive Summary

The School of Pharmacy at the University of Washington embraces the University's overall mission to preserve, advance and disseminate knowledge. The School is an integral part of the UW Health Sciences Center and has a dual purpose of preparing graduates as providers of pharmaceutical care (PharmD) and supporting research and graduate education (MS, PhD, PharmD/MS and PharmD/PhD).

This self-study document describes our four graduate programs: Medicinal Chemistry, Pharmaceutics, Pharmaceutical Outcomes Research and Policy, and the newest program, Biomedical Regulatory Affairs. Each is at the forefront of research and training in the pharmaceutical sciences. The Departments of Medicinal Chemistry and Pharmaceutics have built upon pre-existing strengths in biotransformation enzymology/drug-drug interaction mechanisms and pharmacokinetics to now include drug transport biology, targeted drug delivery, and biophysical approaches to developing novel antimicrobial treatments, as areas of research concentration. Research activities are directed toward the molecular, biophysical and cellular aspects of the pharmaceutical sciences and incorporate pharmacogenomic, proteomic and metabolomic tools to answer basic and translational questions relevant to optimizing disease treatments. They also incorporate the higher order perspectives of physiological modeling and systems biology in the translation of basic science discoveries into therapeutic applications. The Pharmaceutical Outcomes Research and Policy Program (PORPP) has matured into a thriving enterprise that generates clinical and economic metrics and models of therapeutic outcomes that can be used to guide and improve health care decisions. Moreover, it has become a leading voice in comparative effectiveness research and the evaluation and use of innovative approaches to individualized medicine, such as pharmacogenetic testing. Finally, in response to a growing need for well-trained professionals in the regulatory field, the School of Pharmacy has partnered with UW Educational Outreach to offer a MS in Biomedical Regulatory Affairs. The program has just entered its second year and anticipates graduating its first class in 2010.

Challenges that have been met in last ten years for the Departments include: recruiting and mentoring talented junior faculty candidates to replace distinguished senior faculty members who are near retirement or have taken on administrative duties, capturing opportunities in multi-disciplinary collaborative research within and outside of the University of Washington, and attracting a new Dean for the School of Pharmacy. Through this period, we have maintained our leading international position in pharmaceutical research by adapting to the fast-changing paradigms in biomedical research and policy, and continue to provide relevant training for our graduate students for both industrial and academic career paths. We annually place high among the pharmacy schools in external funding per faculty FTE.

We place a strong emphasis on student achievement and satisfaction in our graduate programs. The results of this self-study indicate that we have managed to maintain high quality pharmaceutical sciences training programs (key highlights in the Summary Tables below) that offer exciting research opportunities in keeping with the continual developments in our disciplines, and a rewarding and productive academic experience for our trainees. While our graduate programs face a number of fiscal and administrative uncertainties in the next decade, we are well equipped and positioned to meet these coming challenges.

Summary Table A. Key Metrics of the School of Pharmacy Graduate Programs

Department/Program	Medicinal Chemistry	Pharmaceutics	Pharmacy PORPP	Pharmacy MSBRA
Number of Faculty	11	12	12	9
Number of Faculty Involved in Graduate Training	9	11	12	9
Core (tenure-track)	9	8	6	6
Adjunct/Affiliate	—[1]	—[1]	4	7
Research/Non-tenure-track	—[1]	3	2	—[1]
Budget (2008–2009)	$6,614,859	$5,042,499	$3,540,494	$471,200
Current number of graduate students				
PhD	27	24	15	—[1]
MS	—[1]	1	5	44
Average number of students per year (2000–2009)				
Applied	39	48	16	33
Accepted	7	6	3	26
Enrolled	4	4	3	24
Average time to graduation (2000–2009)				
PhD	6.2	5.6	5.0	—[1]
MS	—[1]	2.3	2.5	—[2]
Number of graduates (2000–2009)				
PhD	28	26	15	—[1]
MS	—[1]	6	9	—[2]
Current employment graduates (2000–2009)				
Industry	57%	47%	33%	—[2]
Academia[3]	39%	25%	33%	—[2]
Regulatory	4%	19%	0%	—[2]
Other	0%	9%	34%	—[2]
Total number of student publications in last 5 years[4]	119	86	51	—[1]

[1]Not applicable

[2]No data available as first graduating class expected Spring 2010

[3]Includes postdoctoral, research scientist, and faculty positions

[4]Completed while in graduate school (prior and subsequent publications listed by student in Table 7)

Summary Table B. 2007–08 Ranking of Extramural Funding per Faculty FTE

Institution	Faculty FTE			Extramural Funding				Funding per Faculty FTE
	PhD	PharmD	Total	NIH, Including Subcontracts	Other Federal	Foundation/ Associations	Total	
University of California, San Diego	14	8	22	$7,436,647	$1,366,372	$279,569	$9,082,588	$412,845
University of Kansas	40	8	48	$17,660,489	$57,974	$278,932	$17,997,395	$374,946
University of California, San Francisco	45	35	80	$26,265,500	$1,297,170		$27,562,670	$344,533
University of Washington	29	13	42	$12,815,787	$625,296	$846,537	$14,287,620	$340,181
University of North Carolina, Chapel Hill	59	23	82	$21,182,935	$1,870,813	$1,417,880	$24,471,628	$298,434

American Association of Colleges of Pharmacy. Top 5 Schools of Pharmacy, 2007–2008

Section I: Overview of the School

Mission and Organizational Structure

The University of Washington School of Pharmacy is a professional health sciences school and does not offer undergraduate degrees. Because the graduate faculty in the School are integrated to varying degrees with the professional Doctor of Pharmacy Degree (PharmD) program, the overall vision and mission of the school are provided. This provides context for the role and content of the graduate programs within the school.

School Vision

To be recognized nationally and internationally as a leader in pharmacy education, research and service which partners effectively with others in society to promote the discovery, development and appropriate use of medications for the welfare and safety of the public.

Mission Statement

To support research and graduate education and to foster the interest of students who seek to engage in research through the School's graduate and professional programs.

To prepare professional students for entry into a life-long career in the profession of pharmacy as providers of pharmaceutical care.

To promote life-long learning of pharmacists by facilitating opportunities for post-graduate and continuing education.

Vision for Graduate Education, Postdoctoral Training, and Research

To be recognized nationally and internationally as the premier School of Pharmacy for educating the next generation of scientific leaders who have the expertise to integrate knowledge in chemistry and biology, or health policy and economics, both to carry out cutting edge basic and translational pharmaceutical research, and to train critical thinkers who make the best informed decisions at preclinical and clinical stages of drug discovery and development.

Vision for Professional Education

To be recognized nationally and internationally as a leader in educating the next generation of pharmacists who are able to partner with other health professionals to create innovative solutions that will elevate the quality of the lives of our diverse citizenry.

Degrees Offered by the School

The School is organized into the Departments of Medicinal Chemistry, Pharmaceutics, and Pharmacy. The three departments collaborate to provide educational instruction and research that facilitate the achievement of the School's mission and goals.

The School offers the MS and PhD in Medicinal Chemistry, Pharmaceutics or Pharmaceutical Outcomes, and the MS in Biomedical Regulatory Affairs. A new pathway is available to allow selected students the opportunity to begin a MS or PhD degree while completing the PharmD (Joint PharmD/MS or Joint PharmD/PhD). Certificates in Biomedical Regulatory Affairs and in Clinical Trials are offered through UW Educational Outreach (UWEO).

In October 2009 the UW Board of Regents approved a new graduate degree, the Master of Science in Pharmaceutical Bioengineering. The Department of Bioengineering is the sponsoring department and the program will have significant teaching contributions from both the Departments of Medicinal Chemistry and Pharmaceutics. It also will be offered through UWEO.

The School also awards the professional Doctor of Pharmacy degree (PharmD) to 86 graduates each year through our traditional four-year curricular pathway and to approximately 20 pharmacists each year through our external non-traditional program with UW Educational Outreach. This latter program is sunsetting in 2011.

Staffing and Governance

The School of Pharmacy is the smallest of the schools on campus and consists of 62 faculty (FTE), 800 volunteer clinical and affiliate faculty, 27 Professional Staff (FTE), 11 Classified Staff (FTE), 346 PharmD students, 93 External PharmD students, 63 PhD students, 50 MS students, and 15 Postdoctoral Fellows.

The organizational chart for the School is found in Appendix A. The administrative officers of the School are the Dean, three Associate Deans, an Assistant Dean, and the three Department Chairs. The Executive Committee is the primary strategic planning group and consists of the Dean, the three Department Chairs, and the School's Administrator. The Senior Leadership Committee consists of the Executive Committee as well as the Associate and Assistant Deans, the School Faculty Council and other faculty representatives who provide advice and oversight for the implementation of broad policy decisions. Additionally, the Administrator of the School and the Director of Advancement play key roles by overseeing our operational, funding and outreach needs. Each Department, with input from their faculty, independently sets the admission, retention, and graduation criteria for their MS and PhD degrees, in consultation with the School leadership and the Graduate School.

The graduate faculty in all three Departments (Appendices C & F) are highly engaged in their respective local, regional, national, and international research communities, and from these interactions come much of the context and perspective for maintaining and extending our graduate training and research agenda. For the past several years, the School has made extensive use of its Corporate Advisory Board, an external group of industrial scientists in positions of decision making, who have influence among their peers, who are capable of providing advice and financial support, and who are committed to advancing pharmaceutical research. The Board meets yearly with our faculty to advise us on key issues regarding research strategy, curriculum development, and fund raising.

Educational and Research Environment

The School of Pharmacy graduate programs are all housed within the H-wing of the Magnuson Health Sciences Center (MHSC), although each department leases off-campus wet-lab and office space for faculty research and service activities that include graduate training. The School occupies 31,000 sq ft of space in the MHSC H-wing, another 6500 sq ft in the 4225 Roosevelt Building (shared with Environmental and Occupational Health Sciences) or the Roosevelt Commons building, and 3000 sq ft at the Western building in downtown Seattle (part of the UW Primate Center). For the most part, wet-labs are state-of-the art, permitting a full range of cell, molecular and chemistry related pharmaceutical research. Office space includes wireless or cable internet access and contemporary support equipment (e.g., PCs, copiers etc). While space capacity continues to be a need for the School, we have dealt with existing deficiencies primarily through off-campus leases. Fortunately, less than 10% of graduate students are located at more distant sites, and key metrics such as the scope of thesis research, the time-to-graduation and job placement, have not been significantly impacted.

Students in Medicinal Chemistry and Pharmaceutics have access to an expansive range of state-of-the-art instrumentation and technology, either within the School of Pharmacy or through well-established inter-departmental or inter-programmatic collaborations. The School houses a center for mass spectrometry with multiple instrumental platforms including MALDI and quadrupole configurations, for analysis of a wide range of biological and chemical samples and nearly all students utilize this facility directly in their thesis research. In addition the department maintains a high field NMR and time-resolved fluorimeter (shared with Chemistry) which are available at no cost to trainees and which have been used extensively by some students. In addition, students are routinely trained in some combination of flow cytometry, gene array technology, and fluorescence microscopy through interactions with the Center for Ecogenetics and Environmental Health and in protein crystallography or electron microscopy via collaborations that capitalize on the substantial infrastructure in Biological Structure at the University of Washington. The recently established Biophysical Core Facility in the Department of Medicinal Chemistry, which is a component of The Center for Intracellular Delivery of Biologics, will further expand the tools available to

trainees, specifically for analysis of biopharmaceuticals. This facility includes biosensor analysis (SPR), scanning calorimetry, titrating calorimetry, and analytical ultracentrifugation tools. Beyond its own resources, School graduate students have made extensive use of external research facilities that are generally made available on a fee-for-service basis. For example, students in Medicinal Chemistry and Pharmaceutics have made extensive use of the Institute of Translational Health Sciences Clinical Research Center, the Allan Brain Institute Bioinformatics and Data Analysis facility, the Institute for Stem Cell and Regenerative Medicine, the Transgenic Resources Program in the Department of Comparative Medicine, UWMC Laboratory Medicine general testing services, the PET Chemistry and Imaging facility in the Department of Radiology, the Keck Imaging Center, the Flow Cytometry and Cell Analysis facility for confocal microscopy, the Genome Resource Center in the Department of Genome Sciences for high-throughput gene resequencing and genomic data analysis, UW Primate Center, and the Resource for Kinetic Analysis in the Department of Bioengineering, which provides access to the SAAM II kinetic modeling and simulation platform, among others.

With regard to course instruction, the School utilizes common classroom space in the MHSC that can be secured through a central reservation service. We also have a small amount of dedicated classroom space (H-074) and departmental conference rooms that is used for many of our advanced graduate courses.

Budget and Resources

Appendix B presents budget summaries for each program for the last 3 biennia. Graduate Support for our programs is secured primarily through state and research grant funds. Additional funds come from research cost recovery, fellowships (gifts), and training grants. Our Master's degree in Biomedical Regulatory Affairs is a self-sustaining program run through UW Educational Outreach. The department chairs in conjunction with our Advancement staff continually seek additional funding for our programs through grants and gifts.

In general, the Departments provide graduate student support for the first year of study, using a combination for flexible funds that varies with each department: faculty salary recapture, corporate donations (e.g., the Drug Metabolism, Transport and Pharmacogenomic Research (DMTPR) fund), and state-derived Teaching Assistant/Research Assistant (TA/RA) funds. Of note, the extent of direct state support of graduate education in the School through TA/RA positions has diminished steadily over the past two decades; currently there are 2.7, 4.0 and 2.0 student lines (0.5 FTE each) for the Medicinal Chemistry, Pharmaceutics and Pharmacy departments, respectively.

NIH T32 training grants provide a significant amount of RA support for the Medicinal Chemistry and Pharmaceutics programs, principally through the Pharmacology training grant (approximately 7 slots/year). Other federal grants that have provided periodic support for our students include the CTSA-funded clinical sciences training grant, and the Biophysics training grant (administered by Biochemistry). In addition, most recently, some of our students have applied for the Inter-disciplinary Training Program in Cancer and HIV/AIDS Research (applications pending). We continue to look for new ways to partner with our colleagues to secure a greater base of funding for our graduate programs. One proposal under consideration is to partner with the Department of Bioengineering and the Institute for Health Metrics and Evaluation and submit a new pre-doctoral interdisciplinary training grant for Pharmacometric and Health Metric Evaluations. In addition, those students who have entered our dual PharmD/PhD degree program will be encouraged to write and submit individual F31 grant applications, as they transition into a full-time research mode.

Each of the three Departments has come to rely more heavily on funding from the pharmaceutical industry to support graduate education. Some of this is tied to specific research projects and other funds are unrestricted. This has compensated for greater shortfalls from state funding (Pharmaceutics and Medicinal Chemistry) and, in fact, allowed for program expansion (PORPP). Although always a tenuous financial arrangement, we are buoyed by the fact that our graduates are highly sought after by the

pharmaceutical industry, who thus have a vested interest in the continuing health of our training programs.

Finally, the majority of our graduate program support (particularly in Medicinal Chemistry and Pharmaceutics) comes from individual (R01) and program (U01, U10, P01) grant awards (Table 5). Although we have been fortunate to have maintained a relatively stable grant funding base over the last 10 years, this support is increasingly difficult to justify from a grants management perspective with an increased scrutiny on grant productivity and because of the marked increases in the cost of graduate tuition and stipend support at the University of Washington. Also, lapses in grant support often create unexpected burdens on the department budgets in order to maintain full student support. Of all of the funding sources available to the School, this is the most vulnerable.

We continue to struggle with inadequate space. Current faculty find their existing lab spaces unable to support growing research programs. New initiatives relating to viral systems and vaccine development, and the development of a biophysical core facility are constrained by the lack of space. An envisioned new research and training program in molecular structure and systems biology cannot proceed without new space. The recruitment of new scholars, the development of mid-level faculty, and the continued support of senior researchers depend on the provision of adequate lab and office space.

Section II: Teaching and Learning

Graduate Program in Medicinal Chemistry

Student Learning Goals and Outcomes

Learning Goals

The primary goal for student learning is to understand the elements of independent research and experimental science including construction of meaningful hypotheses, experimental design, and data interpretation. Students are expected to master current literature within their field of research, critically evaluate existing and co-existing paradigms, propose novel approaches for validating or challenging these paradigms, and to communicate clearly the importance of their proposals and findings that result from their research. Students must achieve expert-level knowledge of primary research literature within their specific discipline and they must construct and execute well-designed experiments that extend the collective knowledge described in this literature. Research in medicinal chemistry encompasses a broad spectrum of activities including studies pursuant to investigations of the interaction of both drugs and toxic substances with biological systems, and the relationship of chemical structure and dynamics to biological effect and function. Drug metabolism is an area of focus of the Department. General areas of expected competence include structure-function relationships of xenobiotics as they relate to therapy, metabolism and toxicity, including modern methods for characterizing enzyme structure and function, including quantitative analysis involving advanced separation and detection systems. Other more specialized areas include proteomics, as applied to infectious disease and drug metabolism, and structure and function relationships among therapeutically relevant viral systems.

Evaluation of Student Learning

Students are evaluated in didactic courses by combinations of in-class exams, take-home exams, written literature review papers, and research proposals. Students are evaluated for their knowledge of fundamental concepts and of current literature in written cumulative exams and in oral presentations (journal clubs and seminars). The General Exam follows the standard University format and evaluates the student's preparedness for PhD-level research. Similarly, the final dissertation defense exam determines whether the student has achieved the necessary skills and knowledge to earn the degree. Within individual research labs, students present their current research multiple times each year. Student learning is also assessed via oral presentations or posters at national and international conferences, wherein our faculty and students receive input from others in the field. In addition, each August every student is evaluated by their thesis advisor with a written set of recommendations, in direct response to a written self-evaluation by the student.

Student Satisfaction

Student satisfaction with didactic classes is gauged via faculty-written evaluation forms. Also, as a small highly collegial unit, there is extensive informal student-faculty discussion about programmatic issues. In fact, we continually gauge the utility and value of recommended courses through discussions with students. Regarding under-represented minorities (URM), we have recruited in the past five years 2 URM students. Thus, data concerning their satisfaction are sparse. We recommend to under-represented minority students that they get involved in campus groups such as SACNAS (so far we have only Hispanic students among minorities, but are aware of resources for recruiting others such as the National Black Graduate Student Association). Notably, our faculty member Catalano is the UW SACNAS Faculty Advisor.

Findings of these Assessments and their Use

In general the assessments indicate that our students achieve remarkable breadth of knowledge, as required for a multidisciplinary field such as Medicinal Chemistry. Based on our trainees' high rate of success in searches for entry level positions in the pharmaceutical industry and biotechnology, or postdoctoral positions with highly regarded investigators in the field (Table 6), we conclude that our students are well prepared for future career paths. We continually refine the curriculum based on student

feedback. For example, we have experimented with different Journal Club formats (MEDCH 582, Core Courses for all programs are listed in Table 10) in response to student suggestions; also, a recent change in the recommended requirements for Pharmacology courses was in response to student input. Improvements to the seminar series MEDCH 520 were recently implemented, wherein faculty give specific anonymous feedback to the student, and this is presented in a formal one-on-one meeting between the student and the faculty organizer for that quarter. This change responds to a direct request from students for increased faculty input. Also, the topics covered in MEDCH 527 were updated in the last cycle, to include additional material on membrane transporters, again based on suggestions from students. Many such examples exist—we are a responsive faculty. We also are aware of the need to tune the curriculum in response to the job market and professional issues; we have paid particular attention to establishing parallel tracks for the more traditional chemistry-oriented students vs. a biophysical track to optimize the experience of those with interests in the emerging focus on structural and mechanistic enzymology with increased employment possibilities in biophysical areas within the biotechnology sector. A new course (Biophysical Enzymology and Biopharmaceuticals, MEDCH 528) is planned for Winter 2010.

Undergraduates and Non-majors

We have essentially no participation of undergraduates in our graduate program didactic classes. Each year we have a few graduate students from other departments take all or part of the MEDCH 501–503 series including graduate students in Pharmaceutics, and a few from related graduate programs take MEDCH 527, 541, 530. No changes in the learning goals are specified for these students. In the summer of 2009 two undergraduates participated in the Amgen Scholars program, and each did ten-week research internships in laboratories within Medicinal Chemistry (Atkins, Totah).

Instructional Effectiveness

Standardized teaching evaluations are used in all didactic classes, designed by relevant faculty members. Results of these surveys are included each year in each faculty members Professional Activities Update, upon which merit salary increases are based. Opportunities for training in teaching include a program requirement for 2 quarters of Teaching Assistant (TA) experience for all graduate students.

Training/Mentoring Outside the Classroom

As suggested above, faculty retain an open door policy for both professional and graduate students to discuss lecture material or research problems on an *ad hoc* basis. Students are required to participate in weekly seminars and to deliver a seminar each year. In addition, the Department participates in collaborative NIH Training Grants in Pharmacological Sciences, with the Departments of Pharmaceutics and Pharmacology (School of Medicine), and an NIH Training grant in Biophysics (Departments of Chemistry, Biochemistry, Biological Structure, Bioengineering). Trainees in either program take part in annual retreats, which include student presentations or student-hosted seminar speakers. The Biophysics Training Grant also offers “brown-bag lunches” as an informal mechanism for career advising. Also, our students have the opportunity to do twelve-week summer internships with pharmaceutical companies. The internships are mainly with companies that participate in our Corporate Advisory Board (CAB). As a result of our regular interactions with the CAB, there is a high level of familiarity with industrial research projects, so students typically do summer internships that are well matched with their thesis work. These internships provide first hand experience in the industrial research setting.

Student Recruitment

Student recruitment is by standard web-based methods, and visits to regional and national universities by faculty members. Underrepresented minorities are specifically recruited by faculty (not administrative staff) attendance at the annual meeting of the Society for the Advancement of Hispanics/Chicanos and Native Americans in Science (SACNAS) and Annual Biomedical Research Conference for Minority Students (ABRCMS), and by faculty participation the Amgen Scholars Program, which brings outstanding undergrad students to the UW for summer research opportunities.

Academic Progress and Success
Graduate students have frequent contact with multiple faculty members in addition to their primary advisor. They also participate in written cumulative exams in the 2nd year, of which they must pass three of six, on a wide range of topics. Students complete a Department-sanctioned pre-General Exam at the beginning of the third year to help them focus on their research and to gauge weaknesses and strengths in their knowledge base and research design. The entire faculty participates in the pre-General Exam, after which a Supervisory Committee is chosen by the student and Thesis Advisor. Students are encouraged to meet at least once with the Supervisory Committee prior to the General Exam, and they are encouraged to take the exam before the end of Fall quarter, at the beginning of the 4th year. Overall, the program has been highly successful as indicated by an extremely low attrition rate. Only two students in the past 10 years has left the program without completing the degree requirements (Table 6).

Student Preparation for Transition to Career
Students interested in an academic career are provided opportunities to lecture within the professional PharmD program (although this is never required), and graduate advisors are extremely pro-active in helping their students find suitable post-doctoral research positions. Many faculty members are highly engaged in the operations of the pharmaceutical industry and actively solicit information about open positions for dissemination throughout the Department. In addition, each year several students give a seminar or poster presentation at the annual Corporate Advisory Board meeting, which provides excellent exposure to potential employers. Finally, most students also attend at least one national/international conference to network with potential academic or industrial employers.

Graduate Program in Pharmaceutics

Student Learning Goals and Outcomes

Learning Goals
The primary learning goals of the Pharmaceutics graduate program are to understand the fundamental aspects of drug disposition, drug delivery, and drug action in animals and man, critically evaluate the current literature, conduct original independent research, work in a collaborative fashion and effectively communicate research findings. Specific areas of expected competence include: pharmacokinetic theory and modeling, drug absorption and delivery, drug metabolism and transporters, and mechanisms of inter-individual variability in drug disposition processes that include pharmacogenetics and drug-drug interactions. While most of our students pursue the PhD degree, we offer an MS degree as a terminal degree when individuals do not meet the performance criteria for advancement to PhD candidacy, or in special instances when Research Scientists or Postdoctoral Fellows are interested in furthering their education in the pharmaceutical sciences. Details can be found in the Pharmaceutics *Policy and Guidelines* document (Appendix E).

Evaluation of Student Learning
Students are evaluated based on classroom performance as well as the progress of laboratory-based research. Oral communication is assessed frequently during quarterly journal club presentations covering selected topics in Pharmaceutics, yearly departmental seminars based on the students' research, and periodic presentations during lab meetings. In addition, students are evaluated using cumulative written exams administered during the 2nd year, and three committee-based examinations: Master's bypass, General Exam and dissertation defense. The aim of the Master's bypass is to evaluate initial research accomplishments and future research directions, including a tentative thesis topic and experimental approaches that might be taken for implementation. The General Exam is used to evaluate the student's preparedness for PhD-level research. The final PhD dissertation defense determines whether the student has achieved the necessary skills and knowledge to earn the degree. Every year, students complete a self-evaluation and receive critical feedback from their thesis advisor as well as from their Supervisory Committee.

Student Satisfaction

Dr. Lin, the 1st year student advisor, meets with new graduate students on a quarterly basis to advise on coursework, lab rotations and progression through the program. A meeting is held at the culmination of the first year to seek feedback in improving the program for subsequent graduate students. All Pharmaceutics graduate students meet on a quarterly basis with the Chair of the department for departmental-wide updates. We conduct student evaluations at the end of every quarter to evaluate the didactic classes via faculty-written evaluation forms. The department currently has 2 URM students. We work closely with them to ensure that they feel integrated into our program and address any difficulties they may have with individual tutoring or support. Based on the exit interviews administered by the Graduate School, the Pharmaceutics program had an average score of 4.65 (on a scale of 1–5) over the past 10 years (n=17) for overall quality of the program.

Findings of these Assessments and their Use

A major departmental review of the Pharmaceutics doctoral program was conducted in 2006–07. The exercise included an internal review of the curriculum and the pace of doctoral research. It also included written input from graduates who had received their degree in the last 15 years, asking for a critical assessment of how relevant the existing coursework and thesis research was to the performance of their job since leaving graduate school. We have subsequently streamlined the coursework and departmental requirements to allow students to progress at a more rapid pace to the PhD. We moved our core introductory Pharmaceutics course (PCEUT 506) from Winter quarter to the Autumn quarter partially in response to comments from our past and present students and to provide greater continuity in the graduate course sequence. We have removed many of the elective requirements, but added to the didactic core a series of 2 credit graduate-level courses in pharmacology. The topic-focused cumulative exams are now scheduled 2 per quarter in the 2nd year with a pass requirement of 4 out of 8 exams. This has shortened the time to completion of the cumulative exams and decisions about the suitability of a student for graduate work can now be made no later than the end of the 2nd year. Overall, with changes made to the graduate program within the past 7 years, the time to degree for graduate students in Pharmaceutics has decreased from ~6.5 to less than 5.5 years.

We have also been responsive to past and current student input on course content by revising and offering new graduate-level courses. PCEUT 502 is now tailored to focus on drug metabolism and metabolite kinetics and PCEUT 503 covers drug delivery and transport, which has been a research area of major growth in the last decade. Also, we are planning to create a new course (PCEUT 504) that will cover pharmacometrics and advanced pharmacokinetics–pharmacodynamic (PK-PD) modeling.

In response to input from the pharmaceutical industry and academic institutions around the country (through an AAPS focus group) the School of Pharmacy has instituted a joint program offering a PharmD and PhD in Medicinal Chemistry, Pharmaceutics, or Pharmaceutical Outcomes Research. The program has been successful in recruiting four outstanding candidates (two in Pharmaceutics and two in Medicinal Chemistry). We believe that, when they graduate, they will be uniquely suited to become future academic leaders in pharmacy.

Interdisciplinary Experiences

Besides their thesis research, which is often multidisciplinary, spanning from molecular and cell-based studies to in vivo studies in animals, patients or human volunteers, pharmaceutics students participate in several multi-disciplinary programs on the UW campus. For example, our students are part of the T32 pharmacology training grant, which represents a joint program with the Departments of Medicinal Chemistry and Pharmacology. Three to four doctoral students are supported by the program in any given year and approximately eight will get support before graduation. This program provides for a number of training enhancement exercises, including quarterly student lunches and roundtable sessions, student-organized symposia on emerging research topics and career opportunities, annual student research presentations and an informal network of exchange of research findings for educational purposes. In addition, all of our students (as well as those in Medicinal Chemistry) participate in the Biomedical Research Integrity series offered by the Department of Bioethics and Humanities, not only as a

requirement for support from the Pharmacology Training Grant, but as a general departmental policy. This series provides an introduction to best practices in human subjects and animal research, research and publication ethics and a number of other related topics. Pharmaceutics and Medicinal Chemistry faculty participate in the some of the breakout workshops organized for the BRI program. More recently, we have been successful in getting two of our students into the Institute of Translational Health Sciences (ITHS) TL1 pre-doctoral training program (a T32 clinical training program under the UW CTSA grant award). These students are involved in a number of interactions with pre-and post-doctoral trainees, take special clinical research courses and participate in trainee-organized research presentations.

There are other opportunities for interdisciplinary student interactions on and off campus. They routinely interact with students and fellows associated with the Drug Interactions Program Project grant, the Center for Ecogenetics and Environmental Health, the Center for Genomics and Health Care Equality and the ITHS, often seeking input and technical assistance from service cores in the execution of their thesis research. As need dictated, we have in the past supported student access to an on-line course in PK-PD modeling offered through Metrum Research Group and PK modeling and simulation offered through Simcyp. Many of our students (1–2/year) have benefited from industry sponsored summer internships, often to gain additional expertise in a data analysis method such as Pop-PK. Finally, the department also supports the participation of our students in the AAPS (American Association for Pharmaceutical Sciences) student chapter, providing a forum for planned social events, student-invited speakers, and faculty mentoring (Danny Shen and Yvonne Lin).

Students are required to complete the equivalent of 2 quarters as a TA. They are typically assigned to a graduate level course as well as a professional degree course (PharmD). Depending upon the course, students may hold office hours, present brief lectures, provide instructional support as well as participate in the planning stages of the course. Students have the opportunity to attend the annual UW TA conference.

Undergraduates and Non-majors

It is rare for an undergraduate or non-major student outside of the School of Pharmacy to take one of the advanced Pharmaceutics courses. Exceptions include non-matriculated students working in the local biotechnology industry and students from the Public Health Toxicology program. However, the Department welcomes UW undergraduate students from across the campus to undertake research rotations (sometimes in the form of PCEUT 499 credits) in the labs of our faculty as a mechanism to gain valuable career experience and to consider enrollment in our graduate program. Past undergraduate student performances have been exceptional; Michelle Mark recently received the Mary Gates Research Scholarship for outstanding undergraduate research, Efriem Bezabih was invited to present at the Annual Biomedical Research Conference for Minority Students and another, Jessica Tay, was admitted to our graduate program after receiving a BS degree in Biochemistry. Yet another, Hau Do, received funding for undergraduate research from the Howard Hughes Medical Institute (UW HHMI) Integrative Research Internship Program and the Mary Gates Research Scholarship.

Instructional Effectiveness

In addition to the standardized teaching evaluation forms, we provide students with tailored forms asking about particular aspects of the course (for example when new lectures are incorporated into the course). For example, the most recent overall course ratings (on a scale of 1–5) were 4.5 for Pharmacokinetic Principles (PCEUT 506), 4.2 for Advanced Pharmacokinetics (PCEUT 501), 4.4 for Pharmacokinetics of Drug Metabolism (PCEUT 502), and 3.4 for Drug Transport and Delivery (PCEUT 503). From time to time, we also seek input through surveys of our past graduates about the appropriateness of our course content with respect to their employment needs.

The Department routinely conducts peer-peer evaluations for each of our graduate courses. This is particularly critical for our junior faculty who can often benefit from the insight and experience of their more senior colleagues. This oversight extends to faculty reviews of TA performance that not only improve the quality of instruction but also enhance the training of the graduate TA. On occasion, some of

our faculty have made use of central instructional resources such as the UW Teaching Academy to gain a better understanding of how to be a more effective instructor and the UW Center for Institutional Development and Research in order to strengthen their communication skills.

Training/Mentoring Outside the Classroom

Students are assigned to a 1st year student advisor upon entry into the program. The advisor assists the student with selection of courses, laboratory rotations and transition into the graduate program. Students identify a dissertation advisor based on mutual interests at the end of their 1st year. All faculty have an open-door policy, and the proximity of student and faculty offices facilitates collegial interactions.

Student Recruitment

Our students have a diverse background in biological sciences, pharmacy and biochemistry. About a third of our students in the last ten years have advanced degrees (MS, PhD or PharmD) prior to entering our program. Student recruitment is by standard web-based methods, networking with potential applicants at national meetings and conferences, and visits to regional and national universities by faculty members. In addition, we find that our colleagues in pharmaceutical and biotechnology companies will recommend outstanding research staff to our program. For interested applicants, we will schedule informational interviews upon request. With regard to underrepresented minorities, we partner with our colleagues in Medicinal Chemistry to advertise the program at SACNAS and other national meetings. As part of the pharmacology training grant, we are working with colleagues in the Department of Bioethics and Humanities (e.g., Wylie Burke, Helene Stark and Rose James) to establish summer internship opportunities for students at the Northwest Indian college, with the long-term goal of fostering their interest in graduate education in Pharmaceutics, Medicinal Chemistry and Pharmacology.

Academic Progress and Success

Student progress in the program is assessed by the primary advisor and the Chair, as well as either the Master's bypass committee or the Supervisory Committee. It is measured by student performance on the cumulative exams during the 2nd year, and three committee-based examinations: Master's bypass, general exam and dissertation defense. Students are also assessed during quarterly journal club presentations and yearly departmental seminars. The students' Supervisory Committee reviews progress at least annually, if not more frequently. A yearly written review of academic progress is performed by the thesis advisor and student and is reviewed by the department Chair. Students from underrepresented groups are encouraged to participate in training grants, GO-MAP and other student organizations as well as working closely with the faculty to ensure satisfactory progress and success. In addition, the Department of Pharmaceutics has an open door policy that encourages a collegial and supportive environment. Apart from the official mentoring, faculty, postdoctoral fellows, research scientists and other graduate students participate in informal training and mentoring.

Student Preparation for Transition to Career

Students in the program gain expertise in basic biochemical, cellular, and molecular techniques, quantitative analytical methods, and in the elaboration of mathematical models to describe the kinetics of drug disposition and action. A wide range of career paths is available to graduates of this program (Table 6). Opportunities include drug development in the pharmaceutical industry; research in hospitals, institutes, and foundations; teaching and research in academic institutions; and positions with government regulatory agencies. Students learn about the work involved in these various career pathways through faculty as well as through visiting scientists (academic as well as industrial) who present in our seminar series. On these visits, students will typically meet with the visiting scientist for about an hour. In addition, when many of our alumni in the pharmaceutical industry visit the department, they present an informal "career opportunity" seminar, followed by discussion, to our graduate students. Faculty let students know if positions are available, mentor on appropriate career choices, assist with preparation of CV, other documents and oral presentations. Moreover, students have the opportunity to participate in summer internships with pharmaceutical and biotechnology companies. Usually 1 or 2 graduate students participate every year. During their graduate studies, students attend at least one national or international conference to present their research and receive feedback from others in the field. Such meetings also

provide an opportunity for the students to network with former alumni of the department during Alumni Socials organized by the department (e.g. the annual AAPS and ISSX meetings). In addition, every year, the senior students are given an opportunity to present their research at the annual CAB meeting. This further enhances their opportunity to network with CAB members who are often the ultimate hiring managers in the departments of drug metabolism and pharmacokinetics of the major pharmaceutical companies.

There is also a significant amount of mentoring performed by our faculty to prepare students for job interviews, often by non-Supervisory Committee members. For example, Senior Instructor Duane Bloedow, a former executive in the pharmaceutical industry, routinely works with students on their composition of a CV, completion of job applications, and preparation for interviews. Based on the high rate of success in searches for entry level positions in the pharmaceutical and biotechnology industry, or postdoctoral positions with highly regarded leaders in the field (see Executive Summary), we conclude that our students are well prepared for the start of their career.

Graduate Program in Pharmaceutical Outcomes Research and Policy Program

Student Learning Goals and Outcomes

Learning Goals

The primary learning goals of the Pharmacy Outcomes Research and Policy Program (PORPP) graduate program are for students to develop the ability to critically evaluate outcomes research and policy studies, become effective teachers and presenters, and to conduct independent research in at least one of the following areas: health economic evaluation, pharmacoepidemiology, health services research, and pharmaceutical policy. Students must achieve expert-level knowledge of primary research literature within their specific discipline, successfully conduct studies that extend knowledge in the field, and communicate the results of their findings in both written and oral formats. Specific areas of expected competence include epidemiology, biostatistics, health economics, health policy, decision modeling, and cost-effectiveness analysis.

Evaluation of Student Learning

Students are evaluated in didactic courses by combinations of in-class exams, take-home exams, policy papers, research projects, research proposals, and oral presentations. Student progress on independent research projects is evaluated at least once a year during the weekly program seminar program. Students are evaluated for their knowledge of fundamental concepts and of current literature in written cumulative exams covering the following areas: a) health economics and policy, b) pharmacoepidemiology, c) cost-effectiveness and quality of life research, and d) biostatistics. The cumulative exams are administered at the end of the academic year, and students have two opportunities to pass the exam in each area — a requirement before proceeding to the General Exam. The General Exam is used to evaluate the student's preparedness for PhD-level research, and involves a written and oral component, focused on the student's dissertation proposal. The PhD Defense Exam determines whether the student has achieved the necessary skills and knowledge to earn the degree. Student learning is also assessed via oral presentations or posters at national and international conferences, wherein our students receive input from others in the field.

Student Satisfaction

Student satisfaction is evaluated via annual progress reports, didactic course evaluations, discussions with advisors, the graduate program coordinator, and the program director, and an exit interview that is administered by the Graduate School. We also recently held a day-long retreat for the program on April 24, 2009 to promote continuing cohesion and communication within the program. Thirty-three PORPP students, faculty, one alumnus, and staff participated in the retreat at the Talaris Conference Center in Seattle. This could be come an annual event.

Findings of these Assessments and their Use

Course Evaluations. Teaching ratings for core PORPP courses taught by faculty in our program have been in the range of good to excellent. For example, the most recent overall course ratings (on a scale of

1–5; 1 = very poor, 5 = excellent) were 4.5 for Policy Analysis (PHARM 532), 4.0 for Pharmacoepidemiology (PHARM 533), and 4.0 for Cost and Outcomes I and II (PHARM 534 and 535). Courses are continually refined based on student comments. For example, in PHARM 534, students have asked for more in-class examples and earlier instructor involvement with student projects, both of which have been implemented.

Progress Reports. We also receive student feedback from annual student progress reports. Students have raised the following issues: a) lack of detailed understanding of individual faculty members' research, b) need for greater clarity in steps for progress through program, and c) unclear requirements for the 'short-proposal', which is evaluated by all faculty before a student can proceed to writing of their full dissertation proposal. These issues were discussed at PORPP faculty meetings, and changes were implemented to address them. Specifically, the frequency of faculty research presentations in seminar was increased, the PORPP Student Handbook (Appendix E) was revised to clarify steps through the program, and specific requirements for the short proposal were drafted.

Exit Interviews. The exit interviews administered by the Graduate School for the PORPP program are shown in Appendix G. Over the past 2 years, the overall quality of the program has been rated good to excellent, with average scores of 4.5 (n=3) and 4.3 (n=3) on a scale of 1–5.

Undergraduates and Non-majors

We have essentially no participation of undergraduates in our graduate program didactic classes. Several of our core courses are co-listed with the Department of Health Services in the School of Public Health, which draws MPH or MHA students. Physician research fellows and epidemiology graduate students, as well as a few PharmD students, take our Cost and Outcomes courses (PHARM 534/535).

Instructional Effectiveness

Standardized teaching evaluations are used in all didactic classes, designed by relevant faculty members. Results of these evaluations are included each year in each faculty members Professional Activities Update, upon which merit salary increases are based. Peer teaching evaluations are conducted annually for junior faculty, and at least every two years for all others. Opportunities for training in teaching effectiveness are available through University resources.

Training/Mentoring Outside the Classroom

Students are assigned an academic advisor upon entry into the program. The advisor assists the student with selection of courses and identification of independent research opportunities within the program, and collaborative arrangements with other departments at UW and outside research institutions. Students identify a dissertation advisor based on mutual interests during their second or third year. All faculty have an open-door policy, and the proximity of student and faculty offices facilitates informal interactions.

Student Recruitment

Because of the complex and multidisciplinary nature of the field, we generally recruit and accept students who have previous training in health care (e.g., a PharmD or MPH) and/or outcomes research experience. PORPP provides information for prospective students using a standard web-based platform. Students are also recruited by faculty at national and international meetings, and interactions with the Corporate Advisory Board. Under-represented minority students are recruited by mailings of program brochures to schools with higher representation of these individuals. Global Health is an area of growing interest to PORPP, and we have an internationally diverse group of graduate students, with two individuals from Africa, two from Latin American, and one from Japan.

Academic Progress and Success

Every student is evaluated yearly by their advisor with a written set of recommendations, in direct response to a written self-evaluation by the student. Significant issues that are raised are discussed by the entire PORPP faculty at quarterly meetings, or as needed.

Student Preparation for Transition to Career
PORPP faculty members maintain significant contacts in academia, the government sector, consulting firms, managed care, and the pharmaceutical/biotech industry. Opportunities in these areas are discussed in program seminars, and many of our students participate in intern/externships with industry and managed care. Approximately a third of our students obtain positions in academia or research settings, a third in industry or consulting firms, and a third in managed care (Table 6).

Master of Science in Biomedical Regulatory Affairs

Student Learning Goals and Outcomes

Learning Goals
The program for the Master of Science in Biomedical Regulatory Affairs (MSBRA) emphasizes the management aspects of taking a medical product—drug, device or biologic—from conceptualization to marketing, including post-marketing risk-management. This degree program exposes students to networking opportunities with the professional community and student colleagues. Graduates gain contacts vital for professional development.

The program comprises a series of courses that are offered in evening hours and on weekends at Seattle-area locations accessible to working adults. These classroom-based courses are augmented with a practicum that provides focused, in-depth learning opportunities and on-the-job experience. The curriculum bridges theory with practice, drawing on the expertise of faculty and resources from the UW, as well as professionals from the medical products industry in the Northwest. The program's schedule allows students to earn a master's degree within two years.

A professional association of medical products regulatory professionals (Regulatory Affairs Professional Society) has developed an examination process leading to a certificate, RAC. While the MSBRA does not attempt to "teach" to the RAC, its content provides a basis for assessing the coverage by the MSBRA program. We have developed a curriculum map against the RAC exam content outline.

In addition to within-course student assessments, towards the end of the second year, students will take a preliminary examination available to certification applications with the Regulatory Affairs Professional Society and results will be reviewed by faculty and students.

Instructional Effectiveness
The MSBRA program requires that each course conduct evaluations by students using the standard UW Office of Educational Assessment tools, modified to permit evaluation of individual faculty members in multiple-instructor courses. Student evaluations are reviewed with each course master during annual reviews. We plan to use student performance on the RAC trial examination to provide further feedback to faculty.

The program meets annually with its advisory board to review and approve significant content and format revisions to its curriculum, and to keep the program current and responsive to community needs.

Training/Mentoring Outside the Classroom
Core faculty advisors are available for providing independent study opportunities to students (PHARM 595, Special Studies in Pharmacy). The program is developing relationships with various regulatory affairs professional organizations, and encourage students to present poster sessions at association meetings. The Biomedical Regulatory Affairs practicum provides a practical experience for students, allowing them to develop or expand skills in shepherding medical products through regulatory, clinical, and quality assurance steps. The practicum relies upon a site proctor-student relationship. Students work on projects of their own that were developed under the guidance of a preceptor from the practicum site. Student progress is assessed by the practicum course master, who in turn has access to panel of experts in drugs/biologics and medical devices regulatory affairs, to provide oversight and maintain academic integrity.

Student Recruitment

MSBRA benefits from University of Washington Educational Outreach's (UWEO) marketing capability and ongoing recruitment efforts to a broad community of learners. Fee-Based degree programs are included as part UWEO's outreach to the greater Western Washington community through its quarterly catalogs to approximately 500,000 individuals regionally and through robust web presences. On-going outreach to professional organizations, such as the Washington Biotechnology and Biomedical Association, and program participation in information meetings and open houses create an accessible doorway to continually reach and engage a diverse body of professionals who may benefit from the education and opportunities the program provides.

Academic Progress and Success

Students' progress is reviewed quarterly and a mid-program update is provided to each student.

Student Preparation for Transition to Career

In addition to networking opportunities with colleagues and through local and national professional associations, the practicum provides students with practical experience, allowing them to develop or expand skills in shepherding new medical products (drug, device and biologic) through regulatory, clinical, and quality assurance aspects.

Section III: Scholarly Impact

Graduate Program in Medicinal Chemistry

Broad Impact of Faculty Research

All faculty members genuinely hold international reputations in their respective fields, as demonstrated in part by our #1 national ranking among graduate programs in medicinal chemistry based on the Faculty Scholarly Productivity Index (Chronicle for Higher Education, January 12, 2008). As a leader in the field, the Department hosted the ACS 30th National Medicinal Chemistry Symposium in summer 2006. In recognition of the Department's long-standing prominence in the specific fields of drug metabolism and toxicology, the Department will host the 17th International Conference on Cytochrome P450s in summer 2013. Atkins, W. Nelson, Rettie, and Goodlett serve, or have served, on Editorial Boards of journals and Atkins, Rettie, Goodlett, and Catalano have served, or serve, on NIH Study sections or NSF review panels. Among Medicinal Chemistry Programs, ours is one of only a few with state-of-the-art expertise in drug metabolism and toxicity. Examples include the work of Sid Nelson and students, described below, featured on several national and international news shows, and the work of Allan Rettie which has led to a patent concerning the use of genetic tests to minimize risk of warfarin therapy and specific recommendations made to physicians on the package insert of warfarin regarding genetic predisposition to warfarin overdose. We are also poised to make major contributions to the field of viral vaccine development through a new initiative with faculty from the Department of Pharmaceutics.

Impact of Student Research

Collectively the students publish in highly regarded journals with high impact factors and they present their work at national and international conferences. A few specific examples are enumerated here: Elva Gao (2007), via collaboration between the Goodlett and S. Nelson labs, developed software for the analysis of mass spectral protein cross-linking data, and this was licensed for commercial sale. A review article by Abhinav Nath (2008) was the second most cited article in the highly respected journal *Biochemistry* in 2008. The work of Bo Wen (2006), along with others in the S. Nelson and Atkins Labs, concerning interactions between caffeine and acetaminophen, was featured on Fox News and ABC News in September 2007.

Paradigm Shifts and Impact on Program

Programmatic changes in Medicinal Chemistry within the last decade are tangible, and they have been driven directly in response to two specific paradigm shifts. The first shift has been a global move towards systems biology and translational research. This paradigm considers in greater detail the behavior of complex enzyme networks, cells, or human patients, in contrast to the 'reductionist' perspective wherein individual enzymes in isolation were considered to be adequate models. We have not only embraced this shift but lead research aimed at the systems biology of small molecule drug metabolism. Departmental research has included increased effort and grant support associated with proteomics- and genomic-based approaches to probe drug toxicity and drug-drug interactions. In a related and parallel shift, the Department maintains increased awareness of translational research, in accordance with funding mandates of several agencies. Examples of both systems biology and translational efforts are evident in the collaborations between Professors Nelson and Goodlett to explore the proteome and genome responsiveness to drugs, between Rettie and Rieder (Genome Sciences) that has identified the key genetic contributors to warfarin response, between Totah and Santana (Physiology and Biophysics, UW) to understand the role of drug metabolism and inhibitory behavior in cardiac toxicity, and between Atkins and Thummel (Pharmaceutics) to translationally link molecular studies on cytochrome P450 (CYP) allosterism with clinical studies on CYP-dependent drug-drug interactions

The second paradigm shift has resulted from the increase in visibility and importance of therapeutic proteins and macromolecules. Nearly all 'traditional' pharmaceutical companies now aim to have 20% – 30% of their pipeline portfolio consist of 'biologics' as soon as possible. This has been the driving force for a collaborative initiative with Bioengineering aimed to address biophysical aspects of therapeutic

antibodies, siRNA, and other macromolecules, and to collaboratively enhance the School of Pharmacy profile in viral vaccines. Toward this end, members of Medicinal Chemistry (Atkins, Catalano) have become Co-directors of a Biophysical Core of the Center for Intracellular Delivery of Biologics (Stayton, PI. Bioengineering) funded by The Life Science Discovery Fund. In addition, Atkins, Catalano, and Lee (Medicinal Chemistry) have teamed up with Professor Shiu-Lok Hu (Pharmaceutics) to translationally span molecular level mechanistic virology with *in vivo* vaccine studies.

Notably, the second paradigm shift has necessitated the development of a new course that complements courses taught by the Department of Pharmaceutics (Biopharmaceutics and Biotechnology, PCEUT 533 and Biopharmaceutics and Drug Delivery, PCEUT 586). MEDCH 528 (Biophysical Enzymology and Biopharmaceutics), to be taught for the first time Winter 2010, will train students in the molecular level structural and functional analysis of therapeutically relevant proteins. Moreover, we envision significant overlap between some of the course content for this new class and the analytical methods and systems that will be routinely used and considered in the Biophysical Core. Thus, this core facility will have significant training potential.

Collaborative Efforts

Collaborative work within the program and with other units on campus and around the world is too extensive to enumerate in detail here. Within the School of Pharmacy, a NIH-funded Program Project on Drug Interactions, now in its 25th year of continuous funding, includes 5 Faculty members from Medicinal Chemistry and 4 from Pharmaceutics, in addition to several from other departments on campus and across the nation. At the University of Washington we collaborate with the Center of Ecogenetics and Environmental Health, the newly funded Center for Intracellular Delivery of Biologics, members of Departments of Genome Sciences, Biological Structure, Chemistry, Biochemistry, and many other departments.

Junior Faculty Development

Junior faculty are provided with adequate start-up support to establish research infrastructure, relieved of classroom teaching duties for a year after initial appointment and mentored by the Chair and faculty with relevant research experience in the initial grant writing stages.

Diversification of Ranks

The Department has added one woman (Totah) and one Hispanic (Catalano) faculty member in two of the three most recent faculty searches.

Graduate Program in Pharmaceutics

Broad Impact of Faculty Research

The Faculty in the Department of Pharmaceutics are recognized as leading experts in drug metabolism, transporters, drug delivery and pharmacogenetics as evidenced by their service in national and international organizations (AAPS, ASPET, ISSX, ASCPT), their participation as chairs or organizing committees of national or international meetings, as well as invitations to serve on numerous governmental advisory panels (FDA, NIH, the National Academies, and NASA) or as consultants for Pharmaceutical companies. Over the past ten years, the Department of Pharmaceutics has played a significant role in promoting the understanding of drug-drug interactions and developing the Web-based Metabolism and Transport Drug Interaction Database (one of the top-10 revenue generating UW technologies). Several faculty serve on the editorial boards of journals such as the Journal for Pharmaceutical Sciences, Pharmaceutical Research, Drug Metabolism and Disposition, Antimicrobial Agents and Chemotherapy, and Clinical Pharmacology and Therapeutics. In addition, our faculty has been named fellows to the Academy of Pharmaceutical Sciences, American Association for the Advancement of Science, Japanese Society for the Study of Xenobiotics, and American Association of Pharmaceutical Sciences (Danny Shen is the current President-elect).

Our faculty publishes extensively, often in high impact journals including the Journal for Clinical Investigation, Journal of Biological Chemistry, Neuroscience, J Nuclear Medicine, and Clinical

Pharmacology and Therapeutics. The combined Pharmaceutics, Medicinal Chemistry and Pharmacy Outcomes graduate programs was ranked #1 in its discipline by the Chronicle for Higher Education in 2005 and 2006 (the last year reported) with respect to the Faculty Scholarly Productivity Index. One of the key metrics for this evaluation is the number of publication citations per faculty.

Impact of Student Research

Our students are integral to the success of our research program. The following are some of their accomplishments that advance the field and extend beyond authorship recognition. For example, John Hoekman (4th year student) and Professor Rodney Ho developed an intranasal drug-delivery device that bypasses the blood-brain barrier to treat central nervous system diseases and have established a start-up company (Impel Neuropharma) with funding from the University, private investors and the NIH. Amber Dahlin (2008 graduate) was instrumental in instituting collaborations between her mentor, Dr. Joanne Wang and the Allen Institute for Brain Science (Sept. 29, 2007 issue of Science "Google of the Brain: Atlas Maps Brain's Genetic Activity"), and characterizing the expression and function of a novel transporter (PMAT) throughout the brain (Neuroscience 146:1193, 2007).

Students in Pharmaceutics have received an average of 3 to 4 competitive research presentation awards and/or travel grants to national and international meetings each year for the last several years. For example, Jayne Thatcher is receiving a 2009 Educational Research Award from the Society of Forensic Toxicologists, and Peng Hsaio was recognized as the 2009 Outstanding AAPS Student Chapter Chair and received travel awards to present at two AAPS Workshops on Drug Transporters. Aaron Moss also received an AAPS travel award and Li Liu received a travel award from the Center of AIDS Research at the University of Washington to present her work at the ISSX meeting. In addition, John Hoekman received numerous awards for his novel nasal drug delivery system (University of Washington Technology Gap Innovation Award, Grand Prize and Best Innovation Prize-University of Washington Business Plan Competition, and Seattle Business Magazine 2008 Top 25 Innovator in Pacific Northwest).

Paradigm Shifts and Impact on Program

The last ten years have seen an explosion in the area of transporter research, from the identification of novel transporters to development of new technology to image transporter expression and function. Moreover, the promise of pharmacogenetics has been tempered by the reality of complex systems biology problems, which our faculty continues to investigate. In addition, with our colleagues in Medicinal Chemistry, we led efforts to expand drug-drug interactions to related issues of enzyme induction and specific inhibitory mechanisms, metabolite kinetics, multiple enzyme pathways and the changing characteristics of drugs approved in the marketplace. These activities represent a clear paradigm shift for the discipline of pharmaceutical science, which have previously been restricted primarily to descriptive biology and mathematical modeling. This re-direction has tracked programmatic changes at NIH, our principal source of research funding (Appendix B).

Grant support has increased dramatically over the past 10 years and spawned an expansion of the department research operation. Along with the traditional independent R01 source of research support, we sought strategic alliances by applying for larger grants that became available primarily through NIH Requests for Applications (RFAs) in defined areas of research (e.g., SCOR, U10 and U01). In addition, along with the other departments in the School, we established a Corporate Advisory Board, consisting of leaders in the pharmaceutical and biotechnology industry, and a funded Drug Metabolism and Transporter and Pharmacogenomic Research (DMTPR) program. Revenue to this program, totaling over $2.5M in the past five years, supports new faculty development (in both Pharmaceutics and Medicinal Chemistry), post-doctoral fellows, major equipment purchases and novel research directions to help maintain our historical strengths in areas (e.g., drug disposition sciences) that are critical to the pharmaceutical industry. With regard to graduate education, the DMTPR funds recruitment awards (for all three PhD programs), student travel and occasionally student tuition and stipends. We continue to seek outside private funding through increased annual giving and creation of endowments, to be entrepreneurial (creation of cost centers), and to increase funding from grant sources.

Collaborative Efforts

We have continued the history of strong collaborations with the Department of Medicinal Chemistry (Drug Interactions Program Project grant with over 25 years of continuous funding) and the Department of Pharmacology (T32 training grant) and have been a significant participant in the CTSA-funded Institute of Translational Health Sciences (ITHS). We participated (5 faculty) in establishing the University of Washington Obstetric and Fetal Pharmacology Research Unit, implementing the basic science elements of the highly translational and multi-disciplinary grant effort. Our faculty have also been involved for several years in the UW Center for Ecogenetics and Environmental Health, the Center for Genomics and Healthcare Equality, the Institute of Translational Health Sciences, and the Clinical Research Division at the Fred Hutchinson Cancer Research Center and the ITHS. We are looking forward to a major new initiative advancing viral vaccine development with the Department of Medicinal Chemistry, as well as establishing new collaborations with Bioengineering and School of Medicine in the area of pharmacometrics. Each of these activities has had both direct and indirect effects on the graduate training program, through access to specialized instrumentation and intellectual cores and tuition/stipend support.

Finally, the Pharmaceutics faculty plays major roles in interdisciplinary graduate training programs in Public Health Genetics, Health Services Research, Medical Bioinformatics, and Biomolecular Structure and Design, which adds diversity to the training and peer interactions that our pharmaceutics graduate students receive. In addition, many of the faculty members of the Department conduct highly collaborative, multidisciplinary research that spans multiple departments within (e.g., Radiology, Pediatrics, Psychiatry, Nephrology, Gastroenterology, Obstetrics and Gynecology) the University and those at other institutions (e.g., the Fred Hutchinson Cancer Research Center, the University of Barcelona, and Johns Hopkins University). Such research typically involves graduate students resulting in multidisciplinary training of the graduate students.

Junior Faculty Development

During the past ten years, the Department of Pharmaceutics has undergone a major expansion, resulting in the recruitment of five new junior faculty. Two of our new members have been promoted to the rank of Associate Professor. The other three are tenure track and non-tenure track Assistant Professors. The junior faculty have all been provided with start-up support to establish research infrastructure, assume limited teaching duties for the first few years after appointment, and are mentored by the Chair and senior faculty to develop critical skills in research development and grant-writing. Moreover, the junior faculty in the School of Pharmacy meet every month to network and provide peer-mentoring. As an indicator of their success, 4/5 of the junior faculty in Pharmaceutics have been successful in obtaining NIH R01 funding and the 5th has just resubmitted a very competitive revised proposal.

Diversification of Ranks

Given the competitive nature of recruiting high-quality faculty, the Department of Pharmaceutics has been fortunate to recruit three women to the last five new faculty positions. This has shifted the gender ratio of the department significantly from what was once an extreme imbalance.

Graduate Program in Pharmaceutical Outcomes Research and Policy Program

Broad Impact of Faculty Research

Program faculty are recognized at the national and international levels, as evidenced by their service on prestigious committees and invitations to present at scientific and advisory meetings. One faculty member (Ramsey) is President-elect of the largest professional society in our field (International Society for Pharmacoeconomics and Outcomes Research, ISPOR), another (Sullivan) is past-President, and a third (Garrison) is on the Board of Directors – as well as serving as co-editors of the society's journal. Sullivan, Veenstra, Garrison, Ramsey, Stergachis and Gardner have served as AHRQ and NIH reviewers as well as numerous other public and private review committees, and have been invited to present at NIH, CDC, and AHRQ consensus conferences and IOM advisory panels.

The overall goal of faculty research is to improve decision-making in health care through the use of formal policy frameworks and quantitative analyses. In particular, faculty have significant accomplishments in managed care decision making, genomics, global health, and drug safety. These achievements are accompanied by numerous scientific publications and research grants and contracts (Tables 5 & Appendix F). Sullivan and Veenstra have been significantly involved in drafting the 3rd revision of the Academy of Managed Care Pharmacy's (AMCP) Format for submission of clinical and economic evidence for formulary decision making, and Veenstra, Ramsey, Garrison, and Sullivan have provided training to more than one thousand managed care employees and decision makers via AMCP-sponsored continuing educations programs over the past 10 years. Veenstra currently serves on the CDC's Evaluation of Genomic Applications in Practice and Prevention (EGAPP) working group, has served on an IOM panel on genomics, and written five book chapters on genomics and outcomes research. Garrison and Stergachis are working with the Gates Foundation, WHO, and the Global Health Department at UW to assess vaccine technologies and improve drug safety systems in developing countries. Garrison is a member of an FDA working group developing novel approaches to quantifying risk-benefit tradeoffs for drugs, and Gardner serves on the FDA's Drug Safety Advisory Committee.

Impact of Student Research

Examples of our students' research that has had significant impact in the field include alumni Sarika Ogale and Todd Lee's work, along with Affiliate faculty member David Au, on the cardiovascular safety of widely used COPD medications in the VA population. Ryan Hansen and post-doctoral fellows Jon Campbell recently published a paper on the adverse effects of switching between anti-epileptic medications. Higashi, Carlson, and Meckley have published seminal papers in pharmacogenomics, and other notable work has been done in drug or biologic safety (Boudreau, Lee, Ogale, Marciante, Custer, and Do), and patient safety (Chaiyakunapruk).

Paradigm Shifts and Impact on Program

There has been a gradual paradigm shift in healthcare over the past 25 years with the recognition that healthcare decisions have become increasingly complex, and healthcare costs are not well controlled. Methods for addressing these issues have been developed over the past 10–20 years, and the current pressing challenge is applying them in an effective manner. A dramatic shift in the perception for the need for these approaches has occurred very recently, under the rubric of comparative effectiveness research (CER). As discussed below in the Future Directions section, our program is well positioned to pursue work in this area, and recently received two large CER projects as part of the ARRA stimulus funding: ADVICE (Sullivan, co-PI) and CANCERGEN (Ramsey, PI, Veenstra co-I)). The goals of these projects, respectively, are to improve the assessment of cancer services and outcomes, and integrate CER on cancer genomics with a clinical trial collaborative (SWOG).

Other important paradigm shifts in healthcare include 1) the integration of genomic (personalized) medicine, 2) improvement in global health infrastructure, technology, and delivery, and 3) improvement in drug safety. As discussed above, our faculty have adapted to — and led — changes in these areas, and are well positioned for further growth.

Collaborative Efforts

Faculty members work collaboratively on the majority of their research projects – serving as formal co-investigators as specific needs for expertise or resources arise. This is a function of the multidisciplinary nature of the field and the collegial environment in our program, school, and university. For example, Ramsey is the PI of CANCERGEN, Veenstra is the PI on the subcontract to UW, and Garrison is a co-investigator. Sullivan is a co-PI on the ADVICE project with Larry Kessler, chair of the Department of Health Services, and Ramsey is a co-investigator. These collaborations extend beyond the program. For example, Veenstra is a co-investigator on Wylie Burke's center grant on genomics and society (Department of Bioethics and Humanities) and on Ken Thummel's proposed pharmacogenomics center (Department of Pharmaceutics).

Junior Faculty Development

Junior faculty are provided with adequate start-up support to establish research infrastructure, relieved of classroom teaching duties for one to two years after initial appointment, and mentored by the Chair and senior program faculty with relevant research experience in the initial grant writing stages.

Diversification of Ranks

Recruitment of qualified faculty members in the field is a challenge, both nationally and internationally, given the significant growth in the field and low supply of suitably trained and highly experienced individuals. We have successfully recruited four faculty members within the past 10 years (Veenstra, Garrison, Devine, Kadiyala), one of whom is a female, and none of whom have been URMs. We will continue to seek high-quality faculty from diverse backgrounds.

Master of Science in Biomedical Regulatory Affairs

Broad Impact of Faculty Research

The MSBRA program is a new fee-based program; the first class will graduate in Spring 2010. It was initiated at industry and student request. Emphasis for the program – beyond the foundational regulatory affairs and clinical trials series – are risk management (an area of recent emphasis at FDA's Center for Drug Evaluation and Research and the European Medicines Agency and International Standards Organization), quality control statistics, technical writing for regulatory agencies and, to capture the international nature of the medical products industry, a course contrasting regulatory efforts at an international level.

The MSBRA program works closely with the School of Law and the Department of Bioengineering and we are exploring opportunities for joint elective and core courses.

For the MSBRA program, the majority of instructors are part-time faculty (at < 50%), whose primary employment are outside the university. All MSBRA faculty participate in semiannual meetings, funds are made available for professional association membership and travel to professional meetings. The sole half-time faculty member works closely with the program director. All are subject to the Department's process for merit salary and periodic (or Annual) Review.

Section IV: Future Directions

Strategic Plan of the School

The arrival of a new Dean of the School of Pharmacy in Autumn quarter 2008 has prompted efforts to revise and update the School's Strategic Plan. A committee consisting of senior administrators and senior faculty from each Department and Graduate Program, has been appointed by the Dean. This committee is currently synthesizing a draft plan for subsequent approval by the entire Faculty. Although this process is still ongoing (a final draft of the strategic plan will be completed by Winter quarter 2010), the emerging priorities include increased integration of the Departments and Programs in teaching, research and service. In essence, this reflects the increased emphasis on translational science among several funding agencies. We plan to reinforce our historical and existing strengths in drug metabolism, drug interactions, and pharmaceutical outcomes by expanding these scientific areas in specific patient populations (e.g., children, women, elderly). In addition we plan to expand our research strategically into a small number of target areas in parallel with the pharmaceutical and biotechnology industries to ensure that our graduates are trained to lead future research in the industrial, academic, or regulatory sectors. Specific areas of new research are outlined below.

Graduate Program in Medicinal Chemistry

The Graduate Program in Medicinal Chemistry aims to maintain its longstanding international reputation for high quality training of scientists for careers in drug metabolism and related aspects of pharmaceutical sciences, while simultaneously expanding its expertise to include methods and technologies relevant to the newer drug platforms and vaccines, such as therapeutic antibodies, proteins, and viral-based systems. This expansion will seize the opportunities provided by the biotechnology industry and nanotechnology-based medicine. This goal will be reached by modestly expanding and rearranging the course curriculum, by strategically clustering faculty members with overlapping expertise in the Departments of Medicinal Chemistry and Pharmaceutics, and by further strengthening collaborative ties with relevant industrial partners. This expansion will result in a program that provides, under one roof, training for careers in the complete range of pharmaceutical sciences, including academic, government, and industrial sectors. We aim to expand the curriculum and training experience simultaneously with an expansion of diversity within our student pool and our faculty.

An anticipated challenge to achieving these goals is the difficulty in attracting the highest quality faculty members to replace those expected to retire in the next four to six years. Whereas we aim to maintain and expand our existing strength in drug metabolism, our most recent faculty searches have made clear the paucity of appropriately trained outstanding scientists seeking academic positions. An aspect of our ability to attract new faculty is the availability of research space. Entrepreneurial approaches will be required to build a level of support and a space plan adequate to attract the best new faculty. Partnering with other units on campus with which we have developing collaborative ties may be feasible, and increased support from our industrial partners should be explored.

An additional challenge will arise in our ongoing efforts to modify our graduate curriculum to accommodate the "new" pharmaceutical sciences associated with macromolecular drugs. Although this process is already underway, we must consciously avoid dilution of research training during the implementation of new courses. One strategy which may be useful is to incorporate new staff supported by the collaborative Center for Intracellular Delivery of Biologics into the new didactic course work. This would be in line with the training mission of the Center.

Graduate Program in Pharmaceutics

The Department of Pharmaceutics is poised to expand its traditional areas of expertise in drug disposition in directions that will bring forth more direct public health benefits (studies in underserved populations:

children, pregnant women and underrepresented minority groups), promoting novel methods of vaccine development and biological therapeutics, and the treatment of serious acute and chronic diseases (e.g., Alzheimer's, cancer, bone disease). The faculty has been on the forefront of addressing drug safety, and developing novel tools to enhance drug efficacy. We continuously seek input from extramural sources: the Corporate Advisory Board (consisting of leaders in the pharmaceutical and biotechnology industry), collaborators at various institutions within the US and abroad, regulatory agencies (FDA) to guide the future direction of our research. We believe that the Department must continue to make major contributions to the fields described above, as well as broaden its impact in global health (vaccine development and AIDS research), advance novel technologies which can be used in new applications (Drug Interaction Database and Impel Neuropharma), and promote cutting-edge, extramurally funded research at the University of Washington. We also envision an expansion of the PharmD/PhD training program, providing a pipeline of highly talented, multidisciplinary scholars well suited to become faculty in Schools of Pharmacy, both regionally and nationally.

As noted in previously, our graduate program and the accreditation of our professional PharmD program, the School is short of space. Despite these constraints, we will continue to be interdisciplinary and collaborative and will bring our unique strengths to future endeavors that include: a) interfacing with Genome Sciences, the Center for Ecogenetics and Environmental Health, and Biomedical Health Informatics to facilitate a systems biology approach to understanding inter-individual variability in drug response and development of novel drug therapies; b) developing programs in Pharmacogenetics, Predictive Drug Toxicology, and Drug Delivery and Transport; and c) expanding research in the area of infectious diseases, including HIV vaccine development, working with the Washington National Primate Research Center and the Regional Center for Excellence in Biodefense and Emerging Infectious Diseases.

Graduate Program in Pharmaceutical Outcomes Research and Policy Program

Challenges and Opportunities

A challenge faced by our program, as well as similar programs in the country, is the recruitment of highly qualified faculty to mentor our students and build research programs that advance knowledge in the field and provide learning and employment opportunities in Washington State. Two of our core faculty members will be retiring in the next 5–10 years. While the demand for qualified individuals in the field has increased the pool of student applicants, there remains a shortage of individuals advanced in their training and interested in academic careers. To address this challenge, we have begun transition planning, working with our contacts in other training programs and our Corporate Advisory Board to identify potential faculty candidates. We are also using our post-doctoral positions to identify young researchers that may be interested in subsequent faculty positions. Indeed, several of our faculty (Veenstra, Devine, Bresnahan) have been recruited in such a manner.

Another consistent challenge over the past decade has been the relative paucity of federal research support for outcomes research and policy analysis. The NIH has not traditionally been focused on translational and implementation research, and funding through AHRQ has been limited. The need for research in this area has been recognized recently and funding opportunities, at least for the near term, have improved. The challenge for our program will be to capitalize on these opportunities for the long term. Below we describe four areas of research and training we believe represent significant growth areas.

Comparative Effectiveness Research

As witnessed by the current debate on health care reform, tough challenges face the American healthcare system in the coming decades. The work conducted in our program – outcomes research and policy analysis – provides a systematic approach for addressing some of these challenges. We thus foresee a continuing, significant need for training and research in this area. The recently announced comparative effectiveness research (CER) funding initiatives reflect the growing demand. Over $1B in the ARRA funding was slated for CER — approximately $400M to NIH, $300M to AHRQ, and a similar amount to DHHS. Faculty in our program have seized this opportunity, writing multiple proposals in response to released RFAs. To date, we and our collaborators have received two Grand Opportunity (GO) grants of

$4M each (ADVICE and CANCERGEN), as noted above. We expect the infrastructure established with these projects, along with individuals recruited and research accomplished, will position our program, UW, and researchers in the Seattle area in an excellent position to attract additional CER funding in the coming decade. This research will provide much needed information on the relative benefits, risks, and costs of healthcare interventions for patients, clinicians, and healthcare policymakers.

Genomics
Genomics is a rapidly growing area in healthcare, and work in our program by Veenstra and Garrison has helped lay the foundation for outcomes research and policy analysis in this area. We will continue to expand research in this area, as witnessed by key participation in two proposals to the NIH for continuing funding of a Center to assess the impacts of genomics in medicine on society (Center for Genomics and Healthcare Equality, CGHE; Burke, PI), and a novel Center to study the role of pharmacogenomics in improving drug safety and effectiveness in underserved and rural communities in the Pacific Northwest (Thummel, PI). Work in this area will help ensure that genomic technologies are used appropriately and equitably in our various healthcare systems.

Global Health
Global Health is an area of increasing interest, and promises to be an area of rapid growth in the coming decade. Professors Lou Garrison and Andy Stergachis — both with appointments in the Department of Global Health — have ongoing research projects in this area that involve PORPP students. Other faculty have also been involved: Hazlet, Veenstra, Downing, and Bresnahan. PORPP faculty interests embrace not only pharmacoeconomic and pharmacoepidemiologic studies in developing country settings, but also broader policy issues, including pharmacy practice, pharmacovigilance, reimbursement, health workforce, and health financing issues. Dr. Garrison has received support from the Bill and Melinda Gates Foundation and World Health Organization for studies in measles vaccination. And Dr. Stergachis has received support from the Gates to develop a surveillance network for anti-malarials taken during pregnancy. USAID is currently supporting their research through a project called Strengthening Pharmaceutical System, led by Management Sciences for Health. Countries involved include: Namibia, Vietnam, and Ethiopia. We plan to expand and strengthen this program over the next 5 years.

Health Information Technology
Associate Professor Beth Devine is establishing a research program in the area of health information technology and e-prescribing. Work to date has been funded by one large AHRQ grant (Sullivan PI) and one K-award (Devine PI). Sullivan and Devine submitted an ARRA Challenge Grant proposal that received a score in the top 10 percent and have recently submitted 2 other grants to AHRQ. Devine recently completed her PhD in Health Services Research (in addition to PharmD, MBA), and collaborates with other faculty and graduate students in the Department of Biomedical Health Informatics.

Establishing strong training and research programs in these four key areas will position PORPP to be competitive in attracting top students, faculty, and research funding over the coming decade.

Master of Science in Biomedical Regulatory Affairs

The MSBRA program is new and much of its focus is on program coordination, fine-tuning of course content and curricular structure, and associated growing pains. Fee-supported programs must be concerned about sustainability and we rely upon UWEO's established annual programmatic and marketing planning activities to insure sustainability and longevity. UWEO recognizes that the need for continuous identification and cultivation of future program students and the development of relationships with local and national organizations is essential for the long-term success of the program. We are interested in the adequacy of the curriculum and have approached several international professional organizations to participate in our curriculum mapping exercise. Students will be asked to take the Regulatory Affairs Professional Society Self Assessment Examination toward the end of the second year and meet with program faculty to review the results. Reviewing the curriculum map will be one of the outcomes.

An important value for the MSBRA program is a thorough understanding of the regulatory paths for the parallel domains of biologics and drugs versus medical devices. The recent establishment of the FDA's Office of Combination Products emphasizes the convergence of therapeutics and diagnostics that heralds a new domain of regulatory affairs. Another emerging interest both at FDA and with international regulatory agencies is in the area of risk management. Historically, risk management has been an important aspect of medical device development but is gaining strategic importance for drugs and biologics. We believe that our risk management course is unique and hope to build upon its focus.

UWSOP has had a Corporate Advisory Board with representatives from the pharmaceutical industry serving as sounding board and providing strategic advice and support to the school for nearly a decade. The MSBRA program plans to transition its current Advisory Committee in a similar fashion to assume a more active role in program curriculum recommendations, practicum sites, and possible scholarship and research opportunities.

Unit Specific Supplemental Questions

School of Pharmacy Review 2009–2010 Unit ("Part B") Questions for Graduate School Review are below. We have believe we have provided enough background information in this document, that along with the information gathered during the site visit, the review committee can adequately address these questions with us.

1. Please comment on the organizational structure of the School as it relates to graduate education. Should any changes be made that would lead to an improved educational environment?
2. Please comment on the size, scope, quality, and priority assigned to the graduate education programs offered by the School. What are the major strengths and weaknesses, and how should the latter by addressed?
3. How has the quality of students admitted to the graduate programs changed over the last decade? Do the programs in medicinal chemistry, pharmaceutics and outcomes research generate broad interest in high quality students from a diverse array of undergraduate backgrounds, or do they draw from a much narrower pool? Is this a strength or a weakness of our programs?
4. What priority should be given to further developing the joint PharmD/PhD program relative to other more traditional avenues of graduate student recruitment?
5. The School has expanded its scope of research emphasis in recent years. Is this sustainable, and will it enhance or compromise the quality of its graduate programs?
6. How integrated are the departments and their graduate students which each other, and in the research activities of other research units on campus and in the greater Seattle biomedical community? Do these interactions serve to enrich graduate education, or do they detract from a focused learning experience?
7. How has the placement of recent PhD graduates changed over the past three years, during which there has been a contraction in the pharmaceutical industry, and with the ever-growing challenges to an academic career? Has the demand for more graduates in our field diminished?
8. Please comment on the morale of the School's faculty and graduate students.
9. Please comment on the stature of the School compared to others of similar size in U. S. and international universities.
10. Overall, is the School well prepared to meet the challenges of graduate education in the pharmaceutical sciences over the coming decade? If not, which area(s) deserve closest attention?

Information Specifically Requested by the Review Committee

In the Charge Letter of May 28, 2009, the School was asked to "include specific information in the self-study that will assist the committee members as they conduct their review." Below is a list of the requested items and where the information may be found in this document:

1. FTE number and distribution over three programs and 2 degree types under review.	**Table 1**
2. An indication of faculty percent effort by graduate program and in the professional degree program.	**Appendix C**
3. A separate listing of MS and PhD curricula by program and each Department's graduate student handbook, which should contain curricular information.	**Table 10 & Appendix E**
4. The distribution of current trainees by degree, faculty member and program.	**Table 6**
5. Number of trainees by faculty member and program for the past 10 years.	**Table 6**
6. Data on the past 5 years of applicants (number, undergrad institution, grade point and GRE or equivalent score). These need to be broken out by MS/PhD Program if admission is directly to a specific program and degree, as opposed to the School itself.	**Table 8 & Table 9**
7. Placement data on trainees graduating over the past 5 years — where have graduates from MS and PhD programs gone?	**Table 6**
8. GPSS student questionnaire responses (most recent), and exit questionnaire responses (last 3 years) with an indication of % participation for each	**Appendix G**
9. A list of trainee publications for trainees completing their degrees over the past 5 years.	**Table 7**
10. A breakdown of graduate program support by source and program (Institutional, School, grant and contract, professional fees or income, endowment, gifts and other), together with an indication of how students in each program are supported (tuition, grants, loans, scholarships, work-study, TA-ships, etc).	**Table 2 & Table 3**
11. A list of awards and prizes granted to students, and an indication of how many students have received these over the past 5 years.	**Table 11**
12. Clarification of when the decision is made regarding the MS vs PhD tracks in each program: at entry, after 1 yr, or other.	**Appendix E**
13. Clarification of how student progress is tracked, and how problems are identified and resolved.	**Appendix E**
14. A listing of what career counseling is available to students in each program or degree track.	**In text**
15. A listing of enrollment and completion dates for graduate students since the last review, the numbers of students who left the program without completing their degree, and the reason.	**Table 8**

Tables

Appendices

Appendix A: Organizational Chart

Appendix B: Budget Summary

Appendix C: Information about the Faculty

Appendix D: HEC Board Summary

Appendix E: Program Student Handbooks

Appendix F: Faculty Biosketches

Appendix G: Exit Questionnaire Results

Appendix H: Action Taken to Address Recommendations of Previous Review

SCHOOL OF PHARMACY

UNIVERSITY *of* WASHINGTON

Graduate Program Review and Self-Study

Table 1

Membership of School of Pharmacy Graduate Programs

November 2009

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Table 1. Membership of School of Pharmacy Graduate Programs

Department/Program	Number of Faculty Members		Number of Graduate Students	
	Total Faculty Members in Department	Number of Faculty Members Involved in Graduate Training	MS degree	PhD degree
Medicinal Chemistry	11	9 Total	NA	27
Pharmaceutics	12	11 Total (8 Core & 3 Research/Non-tenure)	1	24
Pharmacy – PORPP[1]	12	12 Total (6 Core, 4 Adjunct/Affiliate & 2 Research)	5	12
Pharmacy – MSBRA[2]	9	9 Total (2 Core & 7 Affiliate)	44	NA

[1]PORPP – Pharmaceutical Outcomes Research and Policy Program
[2]MSBRA – Master of Science Biomedical in Regulatory Affairs

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SCHOOL OF PHARMACY

UNIVERSITY *of* WASHINGTON

Graduate Program Review and Self-Study

Table 2

Support Available to Graduate Programs for the Past Year

November 2009

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Table 2. Support Available to Graduate Programs for the Past Year (2008–2009)

Type of Support	Medicinal Chemistry ($)	Pharmaceutics ($)	PORPP ($)	MSBRA ($)
Institutional	1,281,786 State, Other	1,055,613 State, Other	867,087 State	—[1]
School	—[1]	—[1]	14,339 Graduate School Fund	—[1]
Grant and contract	3,527,669 NIH 521,643 NIH-TG [2] 787,055 NSF, Other	2,900,615 NIH 49,997 Non-Profit	2,329,578 Federal, Private, Foundation	—[1]
Professional fees or income	370,324	805,687	86,274	471,200[3]
Significant Gifts, Endowments, Fellowships	126,382	230,587	243,216	—[1]
Grand Total	**$6,614,859**	**$5,042,499**	**$3,540,494[4]**	**$471,200**

[1]Not applicable
[2]NIH-Training Grant
[3]Student fees
[4]PORPP only

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SCHOOL OF PHARMACY

UNIVERSITY *of* WASHINGTON

Graduate Program Review and Self-Study

Table 3

Support Provided to Graduate Students for the Past Year

November 2009

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Table 3. Support Provided to Graduate Students for the Past Year (2008–2009)

	Medicinal Chemistry		Pharmaceutics		PORPP		MSBRA	
Type of Support (Source)	**Number of PhD / MS Trainees**	**Total ($)**	**Number of PhD / MS Trainees**	**Total ($)**	**Number of PhD / MS Trainees**	**Total ($)**	**Number of PhD / MS Trainees**	**Total ($)**
Research Assistantships[1] (Grants, State)	27[2] / —[3]	1,096,119	14 / 1	618,360	5 / 1	141,813	— / 0	
Teaching Assistantships[1] (State, UW Department)	0 / —	0	1 / 0	41,224	1 / 0	10,689	— / 0	
Fellowships[1] (Gift accounts, Grants, Contracts)	1 / —	32,590	5 / 0	206,120	2 / 3	195,049	— / 0	
Loans	0 / —	0	0 / 0	0	0 / 0	0	— / 8	117,275
Scholarships (Magnuson, ARCS, AFPE)	0 / —	0	0 / 0	0	4 / 0	50,350	— / 0	
Work-study	0 / —	0	0 / 0	0	0 / 0	0	— / 0	
Grand Total	28 / **—**	**$1,128,709**	20 / 1	**$865,704**	12 / 4	**$397,901**	— / 8	**$117,275**

[1]Includes tuition, salary/stipend and benefits, unless otherwise indicated

[2]4 of the PhD trainees were only here a partial year

[3]Not applicable

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SCHOOL OF PHARMACY

UNIVERSITY *of* WASHINGTON

Graduate Program Review and Self-Study

Table 4

Institutional Training Grant Support Available to Graduate Trainees

November 2009

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Table 4. Institutional Training Grant Support Available to Graduate Trainees

Medicinal Chemistry

Title of Training Grant	Funding Source (ID Number)	Project Period	Program Director (Department)	Total Trainees Supported This Year	Number of Participating Faculty	Faculty
Environmental Pathology and Toxicology Training Program	NIH T32 ES007032	07/01/08 – 06/30/13	Thomas Montine (Pathology)	0 of 8 Predoctoral (3 Postdoctoral)	27	Nelson Rettie Thummel
Multidisciplinary Predoctoral Clinical Research Training (RMI)	NIH 5T32RR023256-03	9/20/2005 – 6/30/2010	Pamela Mitchell (Nursing)	0 of 10 Predoctoral	13	Rettie Totah
Drug Action, Metabolism and Kinetics	NIH 2T32GM007750-31	07/01/09 – 06/30/14	Allan E. Rettie (Medicinal Chemistry)	3 of 15 Predoctoral (7 total for School of Pharmacy)	34	Atkins Catalano Goodlett Kunze Mao Nelson S Rettie Totah
Nutrition, Obesity and Atherosclerosis	NIH 5T32HL007028-32	07/01/08 – 06/30/13	Alan Chait (Medicine)	(4 Postdoctoral)	38	Goodlett
Environmental Pathology and Toxicology Training Program	NIH 5T32ES007032-32	07/01/08 – 06/30/13	Thomas Montine (Pathology)	0 of 8 Predoctoral (3 Postdoctoral)	27	Eaton Nelson Rettie Thummel
Anesthesiology & Perioperative Medicine Training Grant	NIH 1T32GM086270-01	07/01/09 – 06/30/14	Debra A. Schwinn (Anesthesiology)	0 of 2 Predoctoral	62	Rettie
Training in Molecular Biophysics	NIH 2T32GM008268-21A1	07/01/09 – 06/30/14	Rachel E. Klevit (Biochemistry)	0 of 10 Predoctoral	25	Atkins Catalano

Pharmaceutics

Title of Training Grant	Funding Source (ID Number)	Project Period	Program Director (Department)	Total Trainees Supported This Year	Number of Participating Faculty	Faculty
Environmental Pathology and Toxicology Training Program	NIH T32 ES007032	07/01/08 – 06/30/13	Thomas Montine (Pathology)	0 of 8 Predoctoral (3 Postdoctoral)	27	Eaton Nelson Rettie Thummel
Multidisciplinary Predoctoral Clinical Research Training (RMI)	NIH 5T32RR023256-03	9/20/2005 – 6/30/2010	Pamela Mitchell (Nursing)	2 of 10 Predoctoral	13	Ho Isoherranen Thummel
Drug Action, Metabolism and Kinetics	NIH 2T32GM007750-31	07/01/09 – 06/30/14	Allan E. Rettie (Medicinal Chemistry)	4 of 15 Predoctoral (7 total for School of Pharmacy)	34	Ho Hu Isoherranen Kelly Mao Shen Thummel Unadkat Wang
STD/AIDS Research Training Fellowship Program	NIH 5T32AI007140-32	07/01/08 – 06/30/13	Sheila Lukehart (Medicine, Infectious Diseases & Global Health)	0 of 6 Predoctoral (9 Postdoctoral)	66	Hu
Viral Pathogenesis Training Program	NIH 1T32AI083203-01	08/10/09 – 05/31/14	Julie Overbaugh (Microbiology)	0 of 2 Predoctoral	17	Hu

Pharmaceutical Outcomes Research and Policy Program

Title of Training Grant	Funding Source (ID Number)	Project Period	Program Director (Department)	Total Trainees Supported This Year	Number of Participating Faculty	Faculty
Health Services Research Training at the University of Washington	AHRQ 5T32HS013853-07	7/1/2007 – 6/30/2012	Diane Martin (Health Services)	0 of 6 Predoctoral (1 Postdoctoral)	60	Ramsey Sullivan
Biobehavioral Cancer Prevention and Control Training Program	NIH R25 CA92408	7/1/2006 – 6/30/2011	Donald Patrick (Health Services)	1 of 5 Predoctoral (2 Postdoctoral)	9 members of the Steering Committee	Ramsey Sullivan Garrison Veenstra Shen

Master of Science in Biomedical Regulatory Affairs

Not Applicable

SCHOOL OF PHARMACY

UNIVERSITY *of* WASHINGTON

Graduate Program Review and Self-Study

Table 5

Grant and Contract Support of Participating Faculty Members

November 2009

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Table 5. Grant and Contract Support of Participating Faculty Members

Medicinal Chemistry

Faculty Member	Source of Support and Grant Number	Grant Title	Project Period Active (Pending)	Current Year Direct Costs Awarded (Pending)
Atkins, WM	NIH P01 GM032165–27 (PD: Rettie; PI: Atkins)	Drug Interactions Project 3: Allosteric Mechanism in Cytochrome P450s	8/1/08 – 7/31/13	$263,353
	NIH GM62284	Glutathione S-Transferases and Oxidative Stress	1/1/07 – 12/31/11	$188,395
	NIH GM081569	Effects of Xenobiotics on CYP26 Activity and Retinoic Acid Homeostasis	12/1/07 – 11/30/12	$190,000
	Life Science Discovery Fund (PI: Stayton)	Intracellular Delivery of Macromolecular Drugs	1/1/09 – 12/31/14	$3,031,025
	NIH pending	Single Molecule and Ensemble Studies of P-glycoprotein in Nanodiscs	(4/1/10 – 3/31/13)	($175,000)
Catalano, CE	NIH 5R01GM063943–06	Mechanistic Studies on a Viral DNA Packaging Machine	08/1/06 – 1/31/10	$183,947
	NIH MCB-0648617–003	Physical and Biochemical Characterization of the Portal Complex of Bacteriophage Lambda	08/1/06 – 8/31/09	$172,038
	Life Science Discovery Fund (PI: Stayton)	Center for Intracellular Delivery of Biologics	04/1/09 – 03/31/13	$3,031,025
	NIH R21 pending	Biochemical and Biophysical Characterization of HIV Env Trimer Spikes using Nanodisc Technology: A Novel Platform for Vaccine Development	(12/1/09 – 11/30/11)	($150,000)
Goodlett, DR	NIH 5 U54 AI05714106	NW Regional Center of Excellence for Biodefense and Emerging Infectious Diseases	9/4/03 – 2/28/10	$101,194
	NIH 5P30ES007033–15 (PD: Eaton)	Proteomics Core for Center for Ecogenetics and Environmental Health	4/1/05 – 3/31/10	$80,000
	NIH R33CA099139–04	Parallel Peptide Tandem Mass Spectrometry	9/18/06 – 8/31/09	$311,822
	OCE-0825790	Collaborative Research: Integrating Geochemistry and Proteomics to Assess Protein Sources and Their Fate in Marine Systems	9/1/08 – 8/31/11	$107,678
	NIH 5R01CA107209–03 (PI: Brentnall)	Pancreatic Cancer Protein Biomarkers for Early Detection	9/22/06 – 7/31/11	$339,051
	NIH 1R01HL083481–04 (PI: Schnapp)	Matrix Remodeling in the Lung During HIV Infection	9/29/05 – 6/30/10	$237,045
	NIH 1R01AG033398–01 (MPI: Zhang, Goodlett)	Post-translational Modifications of Proteins in Parkinson's Disease	9/15/08 – 8/31/13	$204,250
	NIH 1U01DK082325–01 (PI: Buchwald)	University of Washington Urologic Chronic Pelvic Pain Syndrome Discovery Center	9/15/08 – 6/30/13	$687,206
	NIH 3R01GM079280–02S1 (PI: Eaton)	Isothiocyanates as specific antagonists of human SXR-supplement	9/1/08 – 8/31/09	$48,750
	NIH 1RC1DK086286–01	Multi-disciplinary proteomics approach to study chronic prostatitis/chronic pelvic pain syndrome (CP/CPPS)	(10/1/09 – 9/30/11)	($303,252)

	NIH 1RC2CA148459–01	Proteome Signatures and Biomarkers in Acute Leukemia	(10/1/09 – 9/30/11)	($933,344)
Kunze, K	NIH P01 GM032165–27 (PD: Rettie; PI: Rettie)	Drug Interactions: Project 1	8/1/08 – 7/31/13	$278,551
	NIH P01 GM032165–27 (PD: Rettie; PI: Kunze)	Drug Interactions: Project 2 Metabolite-dependent drug interactions	8/1/08 – 7/31/13	$282,791
	NIH P01 GM032165–27 (PD: Rettie; PI: Atkins)	Drug Interactions: Project 3 Allosteric Mechanisms in Cytochrome P450s	8/1/08 – 7/31/13	$263,353
Lee, Kelly	NIH 4R00GM080352–03	Influenza Hemagglutinin: Structure, Dynamics, and Cooperativity During Fusion	4/1/07 – 03/31/12	$177,564
Nelson, S	NIH P01 GM032165–27 (PD: Rettie; PI: Atkins)	Drug Interactions: Project 3 Allosteric Mechanisms in Cytochrome P450s	9/1/08 – 7/31/13	$263,353
Nelson, W	NIH P01 GM032165–27 (PD: Rettie; PI: Kunze)	Drug Interactions: Project 2 Metabolite-dependent drug interactions	9/08 – 7/13	$282,791
	NIH GM081569 (PI: Isoherranen)	Effects of Xenobiotics on CYP26 Activity and Retinoic Acid Homeostasis	12/07 – 11/12	$190,000
Rettie, AE	NIH R01 GM068797	Pharmacogenetics of ADRs: Warfarin Toxicity	8/1/09 – 7/31/11	$295,642
	NIH P01 GM32165	Drug Interactions: Core	8/1/08 – 7/31/13	$109,376
	NIH P01 GM32165	Drug Interactions: Project 1	8/1/08 – 7/31/13	$278,551
	NIH T32 GM07750	Drug Action, Metabolism and Kinetics	7/1/09 – 6/30/14	$556,929
	NIH R01 NS053646 (PI: Rieder)	Genetic Factors Influencing Warfarin Dose	1/1/06 – 12/31/09	$221,639
	NIH R01 GM49054	Active Site Models of Mammalian CYP4 Isoforms	1/1/07 – 12/31/10	$200,876
Totah, RA	NIH 5R01HL078888–04 (PI: Psaty)	Pharmacoepidemiology and Pharmacogenetics of Statin AE	9/23/05 – 6/3/10	no cost extension
	NIH R01 pending	Role of CYP2J2 in xenobiotic induced QT-prolongation	(4/1/10-3/31/15)	($225,000)

Pharmaceutics

Faculty Member	Source of Support and Grant Number	Grant Title	Project Period Active (Pending)	Current Year Direct Costs Awarded (Pending)
Ho, RHJY	NIH 5R01 AI077390–02 (PI: Ho)	pH responsive anti-HIV nanoparticles	12/1/08 – 6/30/13	$130,000
	NIH 1R01 AI074409–01A1 (PI: Mittler)	Computational Evaluation of Strategies for Optimizing Anti-Retroviral Therapies	(12/1/09 – 11/30/13)	($150,000)
	NIH 1RC1EB010845–01 (PI: Ho)	Novel gadolinium-nanoparticles for molecular imaging and treatment of glioma	(10/1/09 – 9/30/11)	($308,837)
	NIH pending (PI: Zhang)	Novel MRI Probes for Molecular Imaging of Alzheimer's Disease	(4/1/10 – 3/31/15)	($2,416,815)
	AHRQ 1R01 HS018410–01 (PI: Mittler)	Simulation modeling of cost-effective methods for reducing HIV drug resistance	(12/1/09 – 11/30/12)	($145,717)
	NIH 1R01CA149439–01 (PI: Sasaki)	Use of artemisinin-based, lipid nanoparticles directed to lymph nodes to treat non-Hodgkin's lymphoma in companion dogs	(1/1/10 – 12/31/14)	($288,523)
Hu, S-L	NIH/NIAID 5P01 AI054564–05	Combined Approach to Broadly Protective AIDS Vaccines	9/1/03 – 2/28/10	$1,574,061
	NIH/NIAID 5R01 AI076170–02	Glycan modification, CD4 independence and Env immunogenicity (includes DAIDS non-competing supplement)	2/1/08 – 1/31/12	$420,678
	NIH/NIAID 5P01 AI048240–08 (PI: Ruprecht, RM)	Vaccination against Mucosal HIV Clade C Transmission (Hu – Core B)	9/30/00 – 7/31/12	$130,324
	NIH/NIAID 3P01 AI048240–08S1 (PI: Ruprecht)	Vaccination against Mucosal HIV Clade C Transmission (Hu – ARRA Core B)	9/1/09 – 8/31/11	$116,340
	NIH/NIAID 1P01 AI082274–01 (PI: Lu)	Induction of neutralizing antibodies targeting CD4 binding region of HIV-1 Env (Hu – Project 3)	8/7/09 – 7/31/14	$333,514
	NIH/NCRR P51 RR000166 (PI: Somerman)	Washington National Primate Research Center FY48 (Core Staff Appointment)	5/1/07 – 4/30/12	$181,837
	NIH/NIAID N01 AI060006 (PI: Anderson)	Simian Vaccine Evaluation Units (SVEU-4)	6/22/06 – 6/21/13	$22,340
	NIH/NIAID 5R01 AI077390–01A1 (PI: Ho)	pH responsive anti-HIV nanoparticles	12/1/08 –11/30/13	$254,664
	NIH/NIAID 4R01 AI042552–03A1 (PI: Rossi)	Combinatorial Use of Anti-HIV RNA-based Therapeutics	3/15/07 – 2/28/11	$52,465
	NIH/NIAID 2R21 AI083095–01 (PI: Kimata)	Toward an HIV-1 macaque model	4/1/09 – 3/31/11	$89,229
	NIH/NIAID 1R01 AI080290–01A2 (PI: Ambrose)	Macaque model of HIV-1 infection for vaccine development	(12/1/09 – 11/30/10)	($318,925)

	NIH/NIAID 1P01 AI0886101–01 (PI: Pinter)	Strategies for Eliciting bNAbs Specific for HIV-1 Quaternary Epitopes (Hu – Project 3)	(3/1/09 – 2/28/15)	($307,338)
Isoherranen, N	NIH RO1 GM081569–01 (PI: Isoherranen)	Effect of xenobiotics on CYP26 activity and retinoic acid homeostasis	4/1/08 – 3/31/13	$190,000
	NIH PO1 GM32165–24 (PD: Rettie PD, co-PI: Isoherranen)	Drug Interactions: Project 2 Metabolite-dependent drug interactions	9/1/08 – 8/31/13	$218,021 (Project 2)
	NIH/NIGMS 3R01GM081569–02W1 (PI: Isoherranen)	Effect of xenobiotics on CYP26 activity and retinoic acid homeostasis [ARRA]	9/1/09 – 8/31/12	$135,000
Kelly, E	NIH RO1 GM066233–05 (PI: Wang)	Drug Transport at the CNS Barriers	8/1/07 – 5/31/11	$192,000
	SBRI (PI: Hebert)	Population Pharmacokinetics of Mefloquine, Azithromycin, Sulfadoxine and Pyrimethamine during Pregrancy	1/1/07 – 11/30/14	$35,701
	NIGMS 1R01EY019912–01	Role of CYP4V2 in Bietti's Crystalline Dystrophy	(12/1/09 – 11/30/14)	($250,000)
Lin, YS	NIGMS 3R01 GM079280–02S1 (PI: Eaton)	Isothiocyanates as specific antagonists of human SXR-supplement	2/15/09 – 2/14/10	$90,000
	NIH PO1 GM32165–24 (PD: Rettie)	Drug Interactions: Core	9/1/08 – 8/31/13	$109,376 (Core)
	NIH/NIGMS R01 GM063666 (PI: Thummel)	Hormonal regulation of human CYP3A	4/1/08 – 3/31/13	$225,000
	NIH/NCCAM pending (MPI: Reed, Melville)	CAM versus Conventional Therapy for Antenatal Depression	(12/1/09 – 11/30/12)	($7,850)
	NIH/NICHD pending (MPI: Leeder, Lin)	Exogenous and Endogenous Biomarkers of CYP2D6 Variability in Pediatrics	(12/1/09 – 11/30/14)	($137,519)
	NIH.NICHD 2U10HD047892–06 (MPI: Hebert, Thummel, Easterling)	UW Obstetric-Fetal Pharmacology Research Unit	(12/1/09 – 11/30/14)	($650,000)
Mao, Q	NIH R01GM073715–02 (PI: Mao)	Mechanism of Drug Transport by BCRP/ABCG2	7/1/06 – 5/31/11	$160,212
	NIH.NICHD 2U10HD047892–06 (MPI: Hebert, Thummel, Easterling)	UW Obstetric-Fetal Pharmacology Research Unit	(12/1/09 – 11/30/14)	($650,000)
	DoD pending	Role of Placenta P-gp in Fetal Exposure to DMBA and Mammary Cancer Risk	(2/1/10 – 1/31/12)	($223,950)
	NIH 1R21 ES017831–01	Role of Placental P-gp in Fetal Exposure to DMBA and Mammary Cancer Risk	(12/1/09 – 11/30/11)	($150,000)
Shen, DD	NIH R01 AT004407–01	Herb-Opioid Interactions: Influence of Pharmacogenetics and Poly-Supplements	(12/1/07-11/30/11)	($250,000)
Thummel, KE	NIH RO1 GM63666–05	Hormonal regulation of human CYP3A	4/1/02 – 3/31/12	$225,000
	NIH 3R01GM063666–06S1	Hormonal regulation of human CYP3A [ARRA supplement]	7/16/09 – 6/30/11	$216,565
	NIH PO1 GM32165–24 (PD: Rettie, PI: Thummel)	Drug Interactions: Project 3 Allosteric Mechanisms in Cytochrome P450s	9/1/08 – 8/31/13	$263,353
	NICHD; (PI: Hebert)	UW Obstetric-Fetal Pharmacology Research Unit	5/1/09 – 4/30/10	$424,587
	NIH.NICHD 2U10HD047892–06 (MPI: Hebert, Thummel, Easterling)	UW Obstetric-Fetal Pharmacology Research Unit	(12/1/09 – 11/30/14)	($650,000)

	NIH/NIGMS 1U01 GM092676–01MP (MPI: Thummel, Burke)	Pharmacogenetics in Rural and Underserved Populations	(4/1/10 – 3/31/15)	($1,808,156)
	NIH/NICHD pending (MPI: Leeder, Lin)	Exogenous and endogenous biomarkers of CYP2D6 variability in pediatrics	(12/1/09 – 11/30/14)	($137,519)
Unadkat, J	NIH/NIA R33 AG031485–01	P-glycoprotein and Alzheimer's disease	4/1/08 – 03/31/11	$204,439
	Simcyp Ltd	In-Vitro to In-Vivo prediction of drug interactions involving CYP3A time-dependent inactivation	7/15/09 – 7/14/11	$145,026
	NIH	Nucleoside Transporters: Disposition of Nucleoside Drugs	4/1/05 – 3/31/10	No-cost Extension
	NINDS 1RC1 NS068904–01 (PI: Unadkat)	Drug Interactions at the human blood-brain barrier	10/1/09 – 9/30/11	$325,636
	NIH pending	Drug Interactions at the human blood-brain barrier	(4/1/10 – 3/31/13)	($348,007)
Wang, J	NIH; R01 GM066233–05	Drug transport at the CNS barriers	8/1/02 – 5/31/11	$192,000
	NIH R01 HL091744–01 (PI: McCune)	Population pharmacokinetics/pharmacodynamics in non-myeloablative stem cell recipients	12/1/07 – 11/31/11	$283,744
	NIH.NICHD 2U10HD047892–06 (MPI: Hebert, Thummel, Easterling)	UW Obstetric-Fetal Pharmacology Research Unit	(12/1/09 – 11/30/14)	($650,000)

Pharmaceutical Outcomes Research and Policy Program

Faculty Member	Source of Support and Grant Number	Grant Title	Project Period Active (Pending)	Current Year Direct Costs Awarded (Pending)
Blough, D	Fred Hutchinson Cancer Research Center (PIs: Ramsey, McCune)	Various Staff Assignments	10/1/08 – 6/30/09	$34,737
	Veterans Administration (PI: Reiber)	HSR and D Project — Impact of the DoD Paradigm Shift on VA Amputee Prosthetic Care	2/1/08 – 1/31/10	$47,938
	NIH NICHD Grant # U10 HD 047892 (PI: Hebert)	University of Washington Obstetric-fetal Pharmacology Research Unit	7/1/04 – 4/30/10	$1,084,517
	NIH K08 HS014739-3 (PI: Devine)	Evaluating e-Prescribing in a Community-based, Integrated Health System	8/1/06 – 7/31/11	$96,607
	NIH P01 GM32165 (PI: Rettie)	Drug Interactions	8/1/08 – 7/31/13	$278,551
	NIH RO1 GM63666 (PI: Thummel)	CYP3A	4/1/02 – 3/31/12	$225,000
	NIH R01 GMO 42725 (PI: Patterson)	Pain After Trauma	7/1/07 – 6/30/12	$296,434
	NIH R01D A026438–01A109 (PI: Sharar)	Identifying Virtual Reality Analgesia Mechanisms by Pharmacologic Manipulation	4/1/09 – 3/31/14	$250,000
	Association of Schools of Public Health (PI: Harris)	AIAN Cancer Care	9/30/08 – 9/29/10	$170,524
	NIH R01 GM042725 (PI: Patterson)	Optimizing the control of pain from severe burns	4/1/09 – 4/13/13	$588,570
	NIH U48 DP000050 (PI: Harris)	Localized Prostate Cancer: Decision Making & Outcomes Health Promotion Research Center	9/30/04 – 09/29/10	$525,000
	CDC P01 CD000249 (PI: Harris)	A Retrospective Evaluation of Patterns of Care for American Indian and Alaska Native Men with Elevated Prostate Specific Antigen	9/30/06 – 09/29/10	$338,000
Devine, EB	NIH KO8 HS014739–3	Evaluating e-Prescribing in a Community-based, Integrated Health System	8/1/06 – 7/31/11	$96,607
	Zymogenetics (PI: Chan)	Coagulopathy Pilot	10/14/07 – 10/31/09	$112,101
Garrison, L	Bill & Melinda Gates Foundation	Cost Effectiveness Evaluation of Measles Vaccine Programs and Global Health	6/11/07 – 7/30/09	$252,670
	Eli Lilly	Post-Doctoral Fellowship in Pharmacoeconomic Research	9/1/07 – 2/28/10	$93,502
	World Health Organization	Economic Analysis of Global Measles Eradication	6/1/09 – 5/31/10	$40,917
	Roche	Economic Value of Innovative Treatments Over the Product Life Cycle	11/15/07 – 6/30/09	$54,543

	Pfizer	Post-Doctoral Fellowship in Pharmacoeconomic Research	12/1/07 – 11/30/09	$189,388
	CDC 5U1-8 GD000005 (PI: Veenstra)	Risk-Benefit Framework for Genetic Tests	9/30/08 – 9/29/11	$156,654
	DOD 2U01DK066568-0609 (PI: Flum)	Longitudinal Assessment of Bariatric Surgery (LABS)	10/1/08 – 9/30/10	$792,075
	Management Sciences for Health (PI: Stergachis)	Strengthening Global Pharmaceutical Systems	4/1/08 – 10/31/09	$279,331
	NIH/NHGRI P50HG003374 (PI: Burke)	CEER Genomic Health Care and the Medically Underserved	8/1/05 – 07/31/10	$761,586
	Amylin Pharmaceuticals (PI: Veenstra)	Dosing Frequency and Outcomes	10/1/08 – 11/4/09	$45,119
Hazlet, T	Bill & Melinda Gates Foundation (PI: Louis Garrison)	Cost Effectiveness Evaluation of Measles Vaccine Programs and Global Health	6/11/07 – 7/30/09	$252,670
	NIH/NCRR UI1 RR 025014 (PI: Disis)	Institute of Translational Health Sciences	9/1/07 – 5/31/12	$6,513,229
	State of Oregon (PI: Pinsky)	Drug Reps in the Attic—Smoking out the Influences of the Pharmaceutical Industry on Provider's Prescribing Practices.	1/2/08-5/14/09	$274,384
Kadiyala, S	Bill & Melinda Gates Foundation (PI: Louis Garrison)	Cost Effectiveness Evaluation of Measles Vaccine Programs and Global Health	6/11/07 – 7/30/09	$252,670
Stergachis, A	Management Sciences for Health	Strengthening Global Pharmaceutical Systems	4/1/08 – 10/31/09	$279,331
	Bill & Melinda Gates Foundation	Assessment of the Safety of Antimalarials during Early Pregnancy	(8/1/09 – 7/31/13)	($7,778,384)
Sullivan, S	NIH 1RC2CA148433-0110 (Co-PIs: Kessler, Sullivan)	ADVancing Innovative Comparative Effectiveness research-cancer diagnostics (ADVICE)	9/29/09 – 8/31/11	$3,154,734
	Tufts-NEMC	Elan Alzheimer's Disease Modeling Project	11/20/07 – 11/19/08	$24,578
	Fred Hutchinson Cancer Research Center	Staff Assignment	7/1/08 – 12/31/08	$4,351
	Allergan	Allergan Education Fellowship (1)	7/1/07 – 12/31/09	$121,604
	Allergan	Allergan Education Fellowship (2)	7/1/08 – 6/30/10	$138,677
	Allergan	Allergan Education Fellowship (3)	12/16/08 – 6/30/11	$140,520
	Merck & Company	The Impact of Pharmaceutical Benefit Changes on Asthma Controller Medication Utilization and Outcomes	7/15/09 – 12/31/10	$119,910
	DOD 2U01DK066568-0609 (PI: Flum)	Longitudinal Assessment of Bariatric Surgery (LABS)	10/1/08 – 9/30/10	$792,075
	Washington State Life Sciences Discovery Fund Authority (PI: Flum)	Life Sciences Discovery Fund — SCOAP	10/1/07 – 9/30/10	$1,144,170
	NIH/NCRR UI1 RR 025014 (PI: Disis)	Institute of Translational Health Sciences	9/1/07 – 5/31/12	$6,513,229
	Zymogenetics (PI: Chan)	Coagulopathy Pilot	10/14/07 – 10/31/09	$112,101

Veenstra, D	Centers for Disease Control and Prevention 5U18 GD000005	Risk-Benefit Framework for Genetic Tests	9/30/08 – 9/29/11	$156,654
	Fred Hutchinson Cancer Research Center	Center for Cancer Genomic Evaluations of Comparative Effectiveness (CANCERGEN)	10/1/09 – 9/30/11	$220,135
	Amylin Pharmaceuticals	Dosing Frequency and Outcomes	10/1/08 – 11/4/09	$45,119
	NHGRI (PI: Burke)	CEER Genomic Health Care and the Medically Underserved	8/1/08 – 3/31/10	$761,586
	Bill & Melinda Gates Foundation (PI: Garrison)	Cost Effectiveness Evaluation of Measles Vaccine Programs and Global Health	6/11/07 – 7/30/09	$252,680
	Roche (PI: Garrison)	Economic Value of Innovative Treatments Over the Product Life Cycle	11/15/07 – 6/30/09	$54,543
	NIH/NIGMS 1U01 GM092676–01MP (MPI: Thummel, Burke)	Pharmacogenetics in Rural and Underserved Populations	(4/1/10 – 3/31/15)	($1,808,156)
	National Human Genome Research Institute (PI: Burke)	Center for Genomics and Healthcare Equality	(4/1/10 – 3/31/15)	($4,111,609)

Master of Science in Biomedical Regulatory Affairs

Not Applicable

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SCHOOL OF PHARMACY

UNIVERSITY *of* WASHINGTON

Graduate Program Review and Self-Study

Table 6

Trainees in Graduate Programs

November 2009

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Table 6. Trainees in Graduate Programs (2000–2009)

Medicinal Chemistry

Faculty Member, Past and Current Students	Training Period	Prior Academic Degree			Title of Research Project	Current Position for past trainees
		Degree(s)	Year(s)	Institution(s)		
Atkins, William M.						
Lyon, Robert	1995 – 2002	BS	1995	Western Washington University	Enzymology at the dimer interface of cytosolic glutathione S-transferases	Scientist, Seattle Genetics, Inc., WA
Nieslanik, Brenda (Kelly)	1995 – 2000	BS	1995	Creighton University	A structure-function analysis of the C-terminus in glutathione S-transferase A1-1	Assistant Professor, Gustavus Adolphus College, MN
Ibarra, Catherine (Drendall)	1996 – 2002	BS	1994	Seattle University	The functional role of Phe-10 and the anomalous Tyr-9 pKa in glutathione S-transferase A1-1	Assistant Professor, Duke University, NC
Kung, Irene	2001 – 2002	BS	1996	University of Nevada, Reno	Part I: Cobalt thiolate complexes modeling the active site of cobalt nitrile hydratase. Part II: Formation of inorganic nanoparticles on protein scaffolding in E-coli glutamine synthetase	Scientist, Biotech Company
Lampe, Jed	2000 – 2007	MS	1999	Idaho State University	Allosteric mechanisms of cytochrome P450 3A4 probe using time-resolved fluorescence spectroscopy and steady-state kinetic analysis	Postdoctoral Fellow, University of California, San Francisco, CA
Pearson, Josh	2000 – 2006	BS	1999	California State University, Chico	Surface Plasmon Resonance Analysis of Antifungal Azoles Binding to CYP3A4: Kinetic Resolution of Multiple Binding Orientations	Scientist, Amgen, Inc., WA
Mahajan, Sumit	2001 – 2006	MS	2001	University of Louisiana, Monroe	Design, synthesis and characterization of bivalent glutathione s-transferase inhibitors using combinatorial chemistry	Postdoctoral Fellow, University of California, San Francisco, CA
Balogh, Larissa	2003 – 2009	BS	2003	California State University, Long Beach	Stereoselectivity of HME metabolism by glutathione S-transferases	Postdoctoral Fellow, Pfizer, St. Louis, MO
Nath, Abhinav	2004 – 2008	BA	2003	University of Virginia	Dynamics of ligand binding to CYP3A4	Postdoctoral Fellow, Yale University, CT
Honaker, Matthew	2004 – Present	MS	2004	Western Kentucky University	Dynamics of drug metabolism enzymes	
Shireman, Laura	2002 – Present	BS	2002	Washington State University	Cooperativity in glutathione S-transferases	
Ritchie, Natalie	2005 – Present	BS	2003	Seattle University	Mechanism of P-glycoprotein	
Woods, Caleb	2006 – Present	BS	2006	Alma College	Allosteric mechanism of CYP3A4	
Conner, Kip	2007 – Present	BS	2007	San Francisco State University	Inhibitor design for CYPs	
Catalano, Carlos						
Medina, Elizabeth	2003 – Present	BS	2001	Regis University	Physical and Biochemical Characterization of the Portal Complex of Bacteriophage Lambda	

Nakatani, Eri	2008 – Present	BS	2008	University of Arizona	Assembly and Characterization of hiv gp160 Nanodiscs	
Sanyal, Saurarshi	2005 – Present	MA	2005	Brown University	Effect of Au Surface on Triplex Hybridization and Dissociation Kinetics. Implications for intracellular DNA delivery	
Daggett, Valerie						
Bennion, Brian	1996 – 2003	BS	1996	Utah State University	Computational studies of protein stabilization and denaturation by small molecules	Chemist, Lawrence Livermore National Laboratory, CA
Armen, Roger	1999 – 2004	BA	1998	Whitman College	Simulations of implicated proteins in amyloid diseases	Postdoctoral Fellow, University of Michigan, MI
Beck, David	2000 – 2006	BS	2000	Drexel University	Development of a new molecular modeling program	Senior Scientist, eScience Institute, University of Washington
Day, Ryan	2001 – 2005	BS	2000	University of California, Santa Cruz	Dynameomics and studies of folding funnels	Postdoctoral Fellow, Rensselaer Polytechnic, NY
DeMarco, Mari	2001 – 2006	BS	2001	Mercyhurst College	Using molecular dynamics simulations to explore prion diseases	Postdoctoral Fellow, Complex Carbohydrate Research Center, University of Georgia, GA
White, George	2001 – 2005	MS	1999	University of Guelph, Canada	Simulations of 3-helix bundle proteins and development of more efficient MD methods	Scientific Analyst, ScienceOps
Goodlett, David						
Hengel, Shawna	2004 – Present	BS	2004	Santa Clara University	ADP ribosylation	
Singh, Pragya	2005 – Present	MS	2002	University of Washington	Needle complex structure	
Nguyen, Elizabeth	2006 – Present	BS	2004	University of Washington	Alpha-synuclein structure	
Chapman, John	2008 – Present	BS	2008	University of Arizona	Retinonic Acid Proteomics	
Kunze, Kent						
Smith, Dustin	1998 – 2007	BS	1998	Western Kentucky University	Uncovering mechanism to improve predictions: The alteration in CYP2C9 kinetics by albumin and identifying the cause of the drug-drug interaction between enoxacin and CYP1A2	Postdoctoral Fellow, Center of Drug Discovery, FDA, Rockville, MD
Allen, Kyle	1998 – Present	BS	1997	North Dakota State University	Metabolic intermediate complex formation kinetics	
Vandenbrink, Brooke	2004 – Present	BS	2003	Grand Valley State University	Sequential metabolism in drug metabolizing P450s	
Hanson, Kelsey	2005 – Present	BS	2005	University of Puget Sound	Investigation of sequential metabolism and inactivation kinetics	
Nelson, Sidney						
Gartner, Carlos	1990 – 2001	BS	1989	University of Texas, Houston	Human cytochrome p450 aromatase: Purification and structural studies	Research Assistant Professor, University of Notre Dame, IN
Adams, Michael	1996 – 2001	PharmD	1996	Campbell University	The involvement of mitochondria in the cell death process: Communication from the mitochondria to the nucleus	Assistant Professor, Campbell University, NC

Harrelson, John	1998 – 2005	BS	1994	Gonzaga University	A Comparative Study of Cytochromes P450 2E1 and 2A6: Substrate Dynamics, Multiple Ligand Binding, and Adduct Formation by N-Acetyl-m-aminophenol	Assistant Professor, Pacific University, OR
Ho, Han Kiat	2000 – 2006	BS	1999	University of Singapore, Singapore	An Investigation Of Cellular Responses To Tetrafluoroethylcysteine-Induced Mitochondrial Dysfunction	Assistant Professor, National University of Singapore
Wen, Bo	2000 – 2006	MS	2000	China Pharmaceutical University, China	Analysis of Human CYP3A4 Structure-Function Relationships Using Photoaffinity Labels	Research Scientist, Roche, Palo Alto, CA
Coe, Kevin	2002 – 2008	BS	2000	Seattle University	Genomic, Proteomic and Metabolism Studies on Antiandrogen Drugs	Research Scientist, Johnson & Johnson, CA
Rademacher, Peter	2003 – Present	BS	2003	Western Washington University	Differences in Metabolism and Toxicity of Isomeric Thiophene-containing Drugs	
Stamper, Brendan	2004 – Present	BS	2002	Santa Clara University	Elucidation of Signal Transduction Pathways in the Metabolism of Acetaminophen and its Less Toxic Regioisomer	
Zhao, Chunsheng	2006 – Present	MS	2002	Shanghai Institute, China	Cytochrome P450/b5 Interactions	
Wahlin, Michelle	2007 – Present	BA	2007	University of San Diego	Structure-Toxicity Relationships	
Rettie, Allan						
Henne, Kirk	1995 – 2001	BS	1995	Occidental College	Active site characteristics of the cytochrome P450 4B1 bioactivation enzyme	Principal Scientist, Amgen, Inc., Seattle, WA
Yeung, Catherine	1995 – 2005	BS	1994	University of Michigan	Characterization of inhibition of intestinal CYP3A: Role of sequestration and protein binding	Senior Fellow, Dept. of Pharmaceutics, University of Washington
Dickmann, Leslie	1997 – 2003	BS	1995	University of Wisconsin, Madison	Characterization of CYP2C9 residues important for conferring substrate specificity	Scientist, Amgen, Inc., WA
Tai, Guoying	1999 – 2006	MS	1992	Yunnan University, China	Structural determinants of CYP2C9's substrate specificity, dioxygen cleavage and genetic variability	Scientist, GlaxoSmithKline, NC
Baer, Brian	2000 – 2005	BS	2000	Western Washington University	Autocatalytic mechanism and functional consequences of covalent heme attachment in CYP4B1	Research Scientist Array BioPharmaceuticals, CO
Mosher, Carrie	2002 – 2008	MS	2002	Idaho State University	CYP2C9 binding determinants and activation mechanisms for phenytoin and (S)-warfarin metabolism	Postdoctoral Fellow, Tufts University, MA
Hsia, Clara	2002 – Present	BS	2002	Harvey Mudd College	Biochemical properties of human liver VKOR	
Nakano, Mariko	2004 – Present	BS	2004	University of Washington	Biochemical characterization of the orphan P450, CYP4V2	
Parkinson, Oliver	2005 – Present	BS	2005	University of Kansas	Toxicological consequences of CY4B1 bioactivation	
Au, Nick	2007 – Present	PharmD	2007	University of Washington	Pharmacogenomics of the warfarin-amiodarone drug interaction	
Zumberge, Kayte	2007 – Present	BS	2006	Georgetown University	Mechanistic studies of the pan CYP4 inhibitor Het0016 and its derivatives	
Totah, Rheem						
Dinh, Jean	2007 – Present	PharmD	2007	University of Washington	Investigating the role of CYP2B6 in interindividual variability in methadone dosing	

Pharmaceutics

Faculty Member, Past and Current Students	Training Period	Prior Academic Degree			Title of Research Project	Current Position for past trainees
		Degree(s)	Year(s)	Institution(s)		
Ho, Rodney J.Y.						
McConnachie, Lisa (Scarlett)	1995 – 2002	MS	1995	University of Washington	Effects of genotype and RNA expression on activity of cytochrome P450 2D6: a highly polymorphic drug metabolizing enzyme	Research Scientist, Dept of Environmental Health, University of Washington
Woodahl, Erica	1998 – 2004	BS	1998	University of Notre Dame	Genetic variation in the multidrug resistance gene (MDR1): Impact on drug delivery and disposition	Assistant Professor, University of Montana, MT
Zhang, Tracy (MS)	1998 – 2002	MS	1997	Peking Union Medical College, China	Distribution of liposome-encapsulated daunorubicin in 3fBIO rat brain tumor	Transferred: Biostatistics graduate program, UW
Yimam, Mesfin (MS)	2002 – 2004	DVM	1999	Addis Ababa University, Ethiopia	Identification and Characterization of Primate P-Glycoprotein	unknown
Kinman, Loren (MS)	2003 – 2005	BA	1989	Macalester College	(No thesis required)	Research Scientist, Dept. of Immunology, University of Washington
Crouthamel, Matthew	2003 – Present	BS	2000	Stockton State College	Functional impact of genetic variation in MDR1 (ABCB1)	
Endsley, Aaron	2003 – Present	BS	2000	University of Washington	CD4-specific targeted delivery of anti-HIV drug combination to lymphatic tissues	
Hoekman, John	2006 – Present	BS	2002	University of Minnesota, Minneapolis	Enhanced nose-to-brain delivery	
Jones-Isaac, Kendan	2008 – Present	BS	2005	University of Washington	Novel drug delivery techniques	
Hu, Shiu-Lok						
Isoherranen, Nina						
Tay, Suzanne (MS)	2007 – 2009	BS	2007	University of Washington	Regulation of CYP26 transcription and expression by xenobiotics	Research Associate, Genentech, Inc., South San Francisco, CA
Walker, Alysa	2004 – Present	BS	2001	University of Washington	Mechanisms by which CYP1A2 activity and expression is altered during pregnancy	
Thatcher, Jayne	2005 – Present	BS	2001	University of Washington	Expression and characterization of CYP26B1	
Lutz, Justin	2007 – Present	PharmD	2007	University of Pittsburgh	Kinetics and mechanisms of substrate channeling between cellular retinoic acid binding proteins and CYP26A1	
Topletz, Ariel	2008 – Present	BS	2008	Purdue University	Characterization of biological activity of retinoic acid metabolites	

Kelly, Edward						
Voellinger, Jenna	2008 – Present	BS/MS	2008	State University of New York, Buffalo	Derivation of hepatocytes from stem cells of defined genetic profiles	
Rothagi, Priyanka (MS)	2008 – Present	PhD	2006	Georgia Institute of Technology	Functional analysis of CYP4F22 and its role in Lamellar Ichthyosis	
Levy, Rene						
Carlson, Sonia (MS)	1998 – 2000	BS	1995	University of Washington	A New Data Mining Tool: The Metabolic Drug Interaction Database with Enhanced Search Capability	Senior program manager, Microsoft, WA
Qui, Wei	1995 – 2000	MS	1991	Academia Sinica, China	In Vitro and In Vivo Methods for Predictions of CYP2C9 Kinetic Parameters for Phenytoin and Tolbutamide	Pharmacologist, FDA, Rockville, MD
Wurden, Colleen	1988 – 2000	BS	1988	University of Pittsburgh	Metabolism of Carbamazepine and Inhibitory Drug Interactions	Pharmacist, Redmond, WA
Yao, Caiping	1996 – 2001	BS	1992	Fudan University, China	Comparison of In Vitro and In Vivo Inhibition Potencies of Fluvoxamine Toward CYP1AZ and CYP2C19	PK/PD Leader, Johnson & Johnson, New Brunswick, NJ
Xu, Yun	1999 – 2004	BS	1997	Beijing Medical University, China	Mechanistic Studies on the Differences between in vitro and in vivo Inhibition Potencies of Fluvoxamine towards Various Cytochrome P450s	Senior Clinical Pharmacologist, FDA, Rockville, MD
Lin, Yvonne						
Mao, Qingcheng						
Zhang, Yi	2002 – 2007	MS	2002	Texas State University	Potential impact of Breast Cancer Resistance Protein on drug disposition during pregnancy	Scientist, Genentech, Inc., South San Francisco, CA
Zhou, Lin	2003 – 2009	BS	2001	Zhejiang University, China	Disposition of Glyburide during Pregnancy	Pharmacologist, FDA, Rockville, MD
Shen, Danny						
Lalovic, Bo	1996 – 2003	BS	1996	Albertson College	Pharmacokinetics and Pharmacodynamics of Oral Oxycodone: Role of Active Metabolites	Manager, Pfizer Inc., Groton, CT
Li, Shuang (Cheryl)	1997 – 2002	MS	1997	University of Washington	Brain Transport of Valproic Acid: Involvement of Multiple Organic Anion Transporters	Principal Scientist , Pfizer Inc., Groton, CT
Loughren, Michael	2004 – 2008	MS	1998	University of Texas, Houston	Herb-Opioid Interactions Involving Modulation of Cytochrome P450 Enzymes and P-Glycoprotein	Assistant Professor, US Army Graduate Program in Anesthesia Nursing, San Antonio, Texas
Slattery, John						
Zhao, Ping	1998 – 2002	BS	1997	Beijing Medical University, China	The Influence of Alcohol on Acetaminophen Hepatotoxcity: CYP2E1 Induction and Selective Mitochondrial Glutathione Depletion	Senior Staff Fellow, FDA, Rockville, MD
Qiu, Ruolun	1998 – 2003	MS	1997	Beijing Normal University, China	ABCC2 (cMOAT): Role in hydroxycyclophosphamide elimination from the liver and survival of high dose cyclophosphamide regimens	Research Scientist, Pfizer, Groton, CT
Ren, Aaron (joint student with Wang)	2000 – 2005	BS	1999	Beijing Medical University, China	Immunosuppressants used in the conditioning regimens for hematopoietic stem cell transplantation	Research Scientist, Schering-Plough, NJ

Thummel, Kenneth						
McConn, Donavon	1995 – 2001	BS	1991	University of California, Davis	Metabolic and inhibitory differences between cytochromes P450 3A4 and 3A5	Associate Director, Theravance Inc, San Francisco, CA
Jefferies, Marlene (MS)	1996 – 2001	BPh	1996	University of Missouri, Kansas City	Prediction of intestinal and hepatic first-pass drug extraction	Assistant Director, Community Pharmacy, Texas
Lin, Yvonne	1997 – 2002	BA	1994	University of California, Berkeley	Characterizing the variability in CYP3A - expression and metabolism: Influence of genetics and probe substrate selection	Acting Assistant Professor, University of Washington
Senn, Taurence (MS)	1999 – 2000	BS	1992	University of California, Davis	Induction of CYP3A enzymes by vitamin D analogs	Affiliate Faculty, Shoreline Community College, WA
Dai, Yang	2001 – 2006	MS	1998	China Medical University, China	Impact of the CYP3A5 polymorphism on the metabolic disposition of the calcineurin inhibitors	Senior Research Investigator, Sanofi-Aventis Inc, Malvern, PA
Xu, Yang	2001 – 2005	PhD	2001	Wayne State University	Regulation of intestinal expression and metabolism of 1a,25-dihydroxy vitamin D3	Research Scientist, Amgen Inc, Thousand Oaks, CA
Huang, Weili	2001 – 2006	MS	1999	Peking Union Medical College, China	Impact of CYP3A5 and P-glycoprotein on hepatic and renal drug clearance	Pharmacologist, FDA, Rockville, MD
Templeton, Ian	2003 – 2009	BS	2003	University of Washington	In vitro to in vivo predictions of CYP3A inhibition by itraconazole and its metabolites	Postdoctoral Fellow, University of Manchester, UK
Zheng, Xi (Emily)	2005 – Present	MM	2005	Nanjing University Medical School, China	Aberrant CYP3A dependent vitamin D metabolism as a mechanism of drug-induced osteomalacia	
Yang, Jing	2006 – Present	MS	2006	Oregon State University	Use of midazolam product ratios as a probe of in vivo CYP3A allosterism	
Zheng, Songmao	2007 – Present	BS	2007	Sichuan University	Pharmacogenetics of cyclosporine and tacrolimus	
Buchanan, Megan• (PharmD/PhD)	2008 – Present	BS	2006	University of Washington	Vitamin D metabolism	Currently full-time in PharmD program
Unadkat, Jashvant						
Mathias, Anita	1999 – 2004	MS	1997	Rutgers University	Mechanisms of accelerated clearance of anti-HIV protease inhibitors in pregnancy	Clinical Pharmacologist, Gilead Sciences, Inc., CA
Endres, Chris	2003 – 2008	BS	2000	University of Washington	Disposition of ribavirin in mENT1(-/-) mice	Senior Scientist, Amgen, Inc., Seattle, WA
Zhang, Huixia	2004 – 2009	MS	2003	University of Tennessee, Knoxville	Mechanisms of accelerated clearance of anti-HIV protease inhibitors in pregnancy	Pharmacologist, FDA, Rockville, MD
Moss, Aaron	2004 – Present	BS	2000	Western Washington University	Drug disposition in mENT1(-/-) mice	
Hsiao, Peng	2006 – Present	MS	2006	University of Washington	Drug interactions at the Blood Brain Barrier	
Kirby, Brian	2005 – Present	BS	1997	University of North Dakota	Drug interaction of anti-HIV drugs	
Liu, Li	2006 – Present	BA	2006	University of California, Berkeley	Drug interaction of anti-HIV drugs	

Ke, Ban (Alice)	2007 – Present	MS	2007	Purdue University	P-gp activity at the Blood Brain Barrier in Alzheimer's Disease	
Wang, Joanne						
Ren, Aaron (joint student with Slattery)	2000 – 2005	BS	1999	Beijing Medical University, China	Immunosuppressants used in the conditioning regimens for hematopoietic stem cell transplantation	Research Scientist, Schering-Plough, NJ
Li, Meng	2001 – 2007	BS	1997	Beijing Medical University, China	Transport of nucleosides and nucleoside analogs by organic anion and cation transporters	Research Scientist, Sanofi-Aventis, NJ
Zhao, Mingyan	2002 – 2007	BS	2001	China Pharmaceutical University, China	Structural and functional analysis of a novel organic cation/monoamine transporter PMAT in the SLC29 family	Research Scientist, Theravance, CA
Dahlin, Amber	2002 – 2008	BS	1999	University of Great Falls	Mapping and functional characterization of a novel monoamine transporter PMAT in the mouse brain	Postdoctoral Fellow, University of California, San Francisco, CA
Lee, Nora	2008 – Present	BS	2008	Case Western Reserve University	Metformin Disposition	

Pharmaceutical Outcomes Research and Policy Program

Faculty Member, Past and Current Students	Training Period	Prior Academic Degree			Title of Research Project	Current Position for past trainees
		Degree(s)	Year(s)	Institution(s)		
Gardner, Jacqueline						
Denise Boudreau (PhD)	2000 – 2002	BS, Pharmacy	1992	University of Rhode Island	The Association between HMG-CoA Inhibitor Use and Breast Cancer: A Case Control Study & A Comparison of Patient Interview Data and Pharmacy Records for Antihypertensive, Lipid Lowering, and Antidepressant Medication Use among Older Women	Research Associate, Group Health Cooperative, WA
Thy Do (PhD)	2001 – 2006	BA, Chemistry	1995	Northwestern University	Outpatient Discontinuation of Post-Myocardial Infarction Beta-Blocker Therapy and Its Effect on Recurrent Coronary Events	Manager, Global Epidemiology, Amgen Inc., WA
Garrison, Louis						
Matthew Kerrigan (PhD)	2002 – 2007	BSc, Economics	1995	University at Bradford, UK	Treatment patterns, costs and outcomes of systemic chemotherapy, adjuvant intravesical therapy, and surveillance for urothelial cancer	Director, GlaxoSmithKline, NC
Jamie Cross (PhD)	2004 – Present	BS	1997	Tufts University	A Case Study and Policy Analysis of Novel Quantitative Methods for Drug Benefit-Risk Assessment in Regulatory Decision-Making	
Joseph Babigumira (PhD)	2006 – Present	MS, Health Services Research		Case Western University	Economic Impact of Unsafe Induced Abortion in Uganda	
Catherine Waweru (PhD)	2006 – Present	MSc	2005	University of London, UK	A pharmacoepidemiology study of the association of zidovudine-based antiretroviral therapy and anemia in an HIV population in Namibia	
Hazlet, Tom						
Elizabeth James (PhD)	2004 – Present	PharmD	2004	University of Texas, Austin	Evaluation of Prescription Drug Pay-for-Performance Program: Impact on Prescribing Trends, Budgets, and Patient Outcomes	
Johnson, Eric						
Brian Custer (PhD)	2001 – 2003	BS	1990	University of Oregon	Blood safety and resource allocation: Economic analyses of donated blood safety initiatives	Research Scientist, Blood Centers of the Pacific
Kristen Marciante (PhD)	2001 – 2003	BS, Biology	1994	Emory University	Modeling the long-term, population-based outcomes of diabetic retinopathy	Epidemiology, Cardiovascular Health Research Unit, University of Washington

Sullivan, Sean						
Todd Lee (PhD)	1997 – 2001	PharmD	2000	Drake University	Comparison of the cost-effectiveness of Triamcinolone Acetonide (Azmacort HFA) and Fluticasone Propionate (Flovent) in adult asthmatics in a randomized controlled equivalence trial	Research Assistant Professor, Northwestern University, IL
Nathorn Chiayakunapruk (PhD)	2001	PharmD	2000	University of Wisconsin	Meta-analysis and cost-effectiveness of chlorhexidine gluconate and povidone iodine use for the prevention of catheter-related bloodstream infection	Associate Professor, Pitsanuloak, Thailand
Scott Strassels (PhD)	1997 – 2005	PharmD	1989	University of Arizona	The Association of Demographic and Clinical Characteristics with Pain in Persons who Received Hospice Care in the United States	Assistant Professor, University of Texas, Austin, TX
Sarika Ogale (PhD)	2007	MS		Pharmacy Administration	Outcomes Associated with Medications Used in the Treatment of Chronic Obstructive Pulmonary Disease	Health Economist, Outcomes Research Department, Genentech, Inc., CA
Jon Campbell (PhD)	2003 – 2007	MS	2002	University of Washington	Health Economics Research in Asthma	Assistant Professor, University of Colorado, CO
Deborah Atherly (Phd)	2007 – Present	MPH		University of Washington	Evaluation of the Costs and Health Effects of the Syphilis Rapid Immunochromatographic Strip (ICS) Test in Antenatal Screening Programs in Mozambique	Employed at PATH
Katie Gries (MS)	2008 – Present	PharmD		University of Southern California	Psychometric Evaluation of the VFQ-25 and the VFQ-UI for Age-Related Macular Degeneration	
Patrick Gillard (MS)	2009 – Present	PharmD		University of Washington	Establish the relationship between two migraine-specific measures of health and the EQ-5D questionnaire in adults with chronic migraine	
Ryan Hansen (PhD)	2007 – Present	PharmD		University of Washington	The impact of a-rated switching of anti-epileptic drugs	
D. Eldon Spackman (PhD)	2005 – Present	BA, Economics	2002	University of Calgary, Canada	Health Economics Research in Alzheimer's Disease: Support for Dependence as a Health Outcome and the Development of a Model Evaluating the Cost-Effectiveness of Screening	
Jonathon Watanabe (MS)	2007 – 2009	PharmD		University of Southern California	Global payer analysis, economic benefit of enhanced evidence based drug management, biologic drug utilization and follow-on biologic policy	University of Washington/Allergan, Post-Doctoral Fellowship
Veenstra, David						
Mitchell Higashi (PhD)	1997 – 2001	MBA	1994	Eastern Graduate School	Assessing the Clinical and Economic Impact of Genetic Polymorphisms	Vice President, Health Economics & Outcomes Research, GE Healthcare, WI
Lisa Meckley (PhD)	2002 – 2008	BA	2002	Johns Hopkins University	Clinical Utility, Cost-Effectiveness and Provider Perceptions of CYP2C9 and VKORC1 Genotyping for Chronic Warfarin Therapy	Postdoctoral Fellow, Tufts-New England Medical Center, MA
Jennie Best (PhD)	2002 – 2007	MA, Economics	1994	George Mason University	Preference Values for Health States Associated with Colon Cancer and its Treatment	Director, Health Economics, Amylin Pharmaceuticals
Nina Oestreicher-Hill (PhD)	2001 – 2003	BSE	1990	University of Pennsylvania	Cost and outcomes of gene expression profiling to guide adjuvant chemotherapy in breast cancer	Research Scientist, Genentech, Inc., CA

Mindy Cheng (PhD)	2006 – Present	MS	2004	California State University, East Bay	Orphan drugs: Development and validation of an evidence assessment framework and cost-utility analysis	
Bernardo Goulart (MS)	2008 – Present	MD	1997	Universidade Federal do Rio de Janeiro, Brazil	A SEER study of patterns of use of new agents in advanced non-small-cell lung cancer. Systematic review of the impact of first line chemotherapy on patient-reported outcomes in advanced non-small-cell lung cancer	
Norio Kasahara (PhD)	2008 – Present	BS Pharmacy MPH	1991 2000	Tokyo University of Pharmacy and Life Sciences, Johns Hopkins University	Cost estimation of diagnosis, treatment and care of MCI and DAT in Japan	
Josh Roth (PhD)	2008 – Present	BS MHA	2004 2008	Union College, University of Washington	Risk-Benefit Framework for Genetic Tests	

Master of Science in Biomedical Regulatory Affairs

Faculty Member, Past and Current Students	Training Period	Prior Academic Degree			Title of Research Project	Current Position for past trainees
		Degree(s)	Year(s)	Institution(s)		
Adams, Constance	2009 – Present	BA, J.D	1996, 2001	University of Washington, Seattle University	N/A	
Artman, Tamara	2009 – Present	BS	1986	Carnegie-Mellon University	N/A	
Brown, Carol	2009 – Present	BS, BA, MHA	1976, 1979, 2004	Washington State University (BS and BA), University of Washington	N/A	
Cameron, Natallia	2009 – Present	MD	1997	Vitebsk State Medical University, Belarus	N/A	
Carpenter, Alisha	2009 – Present	BA	2008	University of Washington	N/A	
Chan, Ya-Ling	2008 – Present	BS, MS	2003	National Taiwan University, Taiwan	N/A	
Chaubaul, Aditi	2009 – Present	BS, MS	2005, 2004	Sarojini Naidu Government Girls' Post Graduate College, India, Devi Ahilya Vishwavidyalaya, India	N/A	
Chinniah, Shivanthi	2009 – Present	BS	1994	McGill University, Canada	N/A	
Chung, Kyun	2008 – Present	BS	2004	University of Virginia	N/A	
Doorn, Shannon	2009 – Present	BS	2008	University of Waterloo, Canada	N/A	
Goodwin, Christina	2008 – Present	BS	1995	University of California, Riverside	N/A	
Gu, Sabrina	2009 – Present	BA	2004	Scripps College	N/A	
Hensley, Joseph	2009 – Present	BA	1994	University of Colorado, Boulder	N/A	
Imae, Yoriko	2009 – Present	BA	1995	Kyoto Pharmaceutical University	N/A	
Iseman, Theresa	2008 – Present	BS	1983	Seattle Pacific University	N/A	
Jarrahian, Sohail	2008 – Present	BS	1998	University of Washington	N/A	

Johnson, Robert	2009 – Present	BS	1995	Union College	N/A	
King, Margaret	2008 – Present	BS	1975	Fort Wright College	N/A	
Klasey, Kristen	2008 – Present	BA	1999	Washington State University	N/A	
Lograsso, Joseph	2008 – Present	BS	1996	Cleveland State University	N/A	
Masudi, Raymond	2008 – Present	MD	1990	University of Kinshasa, Kenya	N/A	
McCraith, Stephen	2009 – Present	BS, PhD	1987, 1993	Rochester Institute of Technology, University of Rochester	N/A	
Morris, Bryan	2008 – Present	BS	2001	Pacific Lutheran University	N/A	
Nyaguthii, Stephen	2009 – Present	BS	2005	Kenyatta University, Kenya	N/A	
Orsot, Gina	2009 – Present	BS	2004	California Polytechnic State University, San Luis Obispo	N/A	
Query, Gina	2008 – Present	BA	2003	University of Washington	N/A	
Rael, Matthew	2008 – Present	BA	2003	University of Washington	N/A	
Ragueneau-Majlessi, Isabelle	2008 – Present	MD	1993	Université Pierre et Marie Curie, Saint-Antoine, France	N/A	
Sagawa, Zachary	2008 – Present	BS, MS	1998, 2002	University of Washington, Rockefeller University	N/A	
Shum, Hiu	2008 – Present	BS	2004	University of Washington	N/A	
Simekha, Patrick	2009 – Present	Pharmacy Degree	1991	Kenya Medical Training College, Kenya	N/A	
Sinha, Ajay	2008 – Present	PharmD	2001	University of Washington	N/A	
Slater, Stephanie	2009 – Present	BS, MS	2003, 2004	University of Arizona	N/A	
Sui, Liming	2008 – Present	MS, MD	1988, 1985	Second Medical Military University, China	N/A	
Swardstrom, Meghan	2009 – Present	BA	2006	University of Washington	N/A	
Tao, Yun	2008 – Present	BS, MS	1975, 2008	Shanghai First Medical College, China, University of Washington	N/A	

Thireault, Dennis	2008 – Present	BS	1989	Bemidji State University	N/A	
Timmons, Kenneth	2008 – Present	BA	1981	University of Delaware	N/A	
Upshaw, Lisa	2009 – Present	BS	1994	Wright State University	N/A	
Vaney, Pashmi	2009 – Present	MBBS (Bachelor of Medicine & Surgery)	2004	Bharati Vidyapeeth Medical College, India	N/A	
Velez, Roxanne	2009 – Present	BA	2002	Seattle Pacific University	N/A	
Yang, Zhantao	2008 – Present	MS, MD	1985, 1988	Shanghai Medical University, China	N/A	
Zoungrana, Ranipoma	2009 – Present	BA, MS	1990, 2007	University of Ouagadougou, Burkina Faso, St. Cloud State University	N/A	

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SCHOOL OF PHARMACY

UNIVERSITY *of* WASHINGTON

Graduate Program Review and Self-Study

Table 7

Publications by Trainees During the Last Five Years

November 2009

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Table 7. Publications by Trainees During the Last Five Years (2004–2009)

Medicinal Chemistry

Allen, Kyle
(1998 – Present)
Mentor: Kunze, K

Totah RA, **Allen KE**, Sheffels P, Whittington D, Kharasch ED. (2007) Enantiomeric metabolic interactions and stereoselective human methadone metabolism. *J Pharmacol Exp Ther*. 321, 389-99.
Cameron MD, Wen B, **Allen KE**, Roberts AG, Schuman JT, Campbell AP, Kunze KL, Nelson SD. (2005) Cooperative binding of midazolam with testosterone and alpha-naphthoflavone within the CYP3A4 active site: a NMR T1 paramagnetic relaxation study. *Biochemistry*. 44, 14143-51.
Isoherranen N, Kunze KL, **Allen KE**, Nelson WL, Thummel KE. (2004) Role of itraconazole metabolites in CYP3A4 inhibition. *Drug Metab Dispos*. 32, 1121-31.
McConn DJ 2nd, Lin YS, **Allen K**, Kunze KL, Thummel KE. (2004) Differences in the inhibition of cytochromes P450 3A4 and 3A5 by metabolite-inhibitor complex-forming drugs. *Drug Metab Dispos*. 32, 1083-91

Au, Nick
(2007 – Present)
Mentor: Rette, A

Au N, Rettie AE. (2008) Pharmacogenomics of 4-hydroxycoumarin anticoagulants. *Drug Metab Rev.* 40, 355-75.

Armen, Roger
(1999 – 2004)
Mentor: Daggett, V

Steward RE, **Armen RS**, Daggett V. (2008) Different disease-causing mutations in transthyretin trigger the same conformational conversion. *Protein Eng Des Sel*. 21, 187-95.
Armen RS, Daggett V. (2005) Characterization of two distinct beta2-microglobulin unfolding intermediates that may lead to amyloid fibrils of different morphology. *Biochemistry*. 44, 16098-107.
Armen RS, Bernard BM, Day R, Alonso DO, Daggett V. (2005) Characterization of a possible amyloidogenic precursor in glutamine-repeat neurodegenerative diseases. *Proc Natl Acad Sci U S A*. 102, 13433-8.
Beck DA, **Armen RS**, Daggett V. (2005) Cutoff size need not strongly influence molecular dynamics results for solvated polypeptides. *Biochemistry*. 44, 609-16.
Armen RS, Alonso DO, Daggett V. (2004) Anatomy of an amyloidogenic intermediate: conversion of beta-sheet to alpha-sheet structure in transthyretin at acidic pH. *Structure*. 12, 1847-63.
Armen RS, DeMarco ML, Alonso DO, Daggett V. (2004) Pauling and Corey's alpha-pleated sheet structure may define the prefibrillar amyloidogenic intermediate in amyloid disease. *Proc Natl Acad Sci U S A*. 101, 11622-7.
Day R, Beck DA, **Armen RS**, Daggett V. (2003) A consensus view of fold space: combining SCOP, CATH, and the Dali Domain Dictionary. *Protein Sci*. 12, 2150-60.

Baer, Brian
(2000 – 2005)
Mentor: Rettie, A

Baer BR, Wienkers LC, Rock DA. (2007) Time-dependent inactivation of P450 3A4 by raloxifene: identification of Cys239 as the site of apoprotein alkylation. *Chem Res Toxicol*. 20, 954-64.
Baer BR, Kunze KL, Rettie AE. (2007) Mechanism of formation of the ester linkage between heme and Glu310 of CYP4B1: 18O protein labeling studies. *Biochemistry*. 46, 11598-605.
Baer BR, Rettie AE. (2006) CYP4B1: an enigmatic P450 at the interface between xenobiotic and endobiotic metabolism. *Drug Metab Rev*. 38, 451-76.
Baer BR, Schuman JT, Campbell AP, Cheesman MJ, Nakano M, Moguilevsky N, Kunze KL, Rettie AE. (2005) Sites of covalent attachment of CYP4 enzymes to heme: evidence for microheterogeneity of P450 heme orientation. *Biochemistry*. 44, 13914-20.
Baer BR, Rettie AE, Henne KR. (2005) Bioactivation of 4-ipomeanol by CYP4B1: adduct characterization and evidence for an enedial intermediate. *Chem Res Toxicol*. 18, 55-64.
Cheesman MJ, **Baer BR**, Zheng YM, Gillam EM, Rettie AE. (2003) Rabbit CYP4B1 engineered for high-level expression in Escherichia coli: ligand stabilization and processing of the N-terminus and heme prosthetic group. *Arch Biochem Biophys*. 416, 17-24.
Zheng YM, **Baer BR**, Kneller MB, Henne KR, Kunze KL, Rettie AE. (2003) Covalent heme binding to CYP4B1 via Glu310 and a carbocation porphyrin intermediate. *Biochemistry*. 42, 4601-6.

Balogh, Larissa
(2003 – 2009)
Mentor: Atkins, W

Hutzler JM, **Balogh LM**, Zientek M, Kumar V, Tracy TS. (2009) Mechanism-based inactivation of cytochrome P450 2C9 by tienilic acid and (+/-)-suprofen: a comparison of kinetics and probe substrate selection. *Drug Metab Dispos*. 37, 59-65.
Balogh LM, Le Trong I, Kripps KA, Tars K, Stenkamp RE, Mannervik B, Atkins WM. (2009) Structural Analysis of a Glutathione Transferase A1-1 Mutant Tailored for High Catalytic Efficiency with Toxic Alkenals. *Biochemistry*. Jul 27.
Balogh LM, Roberts AG, Shireman LM, Greene RJ, Atkins WM. (2008) The stereochemical course of 4-hydroxy-2-nonenal metabolism by glutathione S-transferases. *J Biol Chem*. 283, 16702-10.
Hou L, Honaker MT, Shireman LM, **Balogh LM**, Roberts AG, Ng KC, Nath A, Atkins WM. (2007) Functional promiscuity correlates with conformational heterogeneity in A-class glutathione S-transferases. *J Biol Chem*. 282, 23264-74.

Beck, David
(2000 – 2006)
Mentor: Daggett, V

Beck DA, Alonso DO, Inoyama D, Daggett V. (2008) The intrinsic conformational propensities of the 20 naturally occurring amino acids and reflection of these propensities in proteins. *Proc Natl Acad Sci U S A*. 105, 12259-64.
McCully ME, **Beck DA**, Daggett V. (2008) Microscopic reversibility of protein folding in molecular dynamics simulations of the engrailed homeodomain. *Biochemistry*. 47, 7079-89.
Smolin N, Li B, **Beck DA**, Daggett V. (2008) Side-chain dynamics are critical for water permeation through aquaporin-1. *Biophys J*. 95, 1089-98.
Beck DA, Jonsson AL, Schaeffer RD, Scott KA, Day R, Toofanny RD, Alonso DO, Daggett V. (2008) Dynameomics: mass annotation of protein dynamics and unfolding in water by high-throughput atomistic molecular dynamics simulations. *Protein Eng Des Sel*. 21, 353-68.
Beck DA, Daggett V. (2007) A one-dimensional reaction coordinate for identification of transition states from explicit solvent P(fold)-like calculations. *Biophys J*. 93, 3382-91.
Beck DA, Bennion BJ, Alonso DO, Daggett V. (2007) Simulations of macromolecules in protective and denaturing osmolytes: properties of mixed solvent systems and their effects on water and protein structure and dynamics. *Methods Enzymol*. 428, 373-96.
Beck DA, White GW, Daggett V. (2007) Exploring the energy landscape of protein folding using replica-exchange and conventional molecular dynamics simulations. *J Struct Biol*. 157, 514-23.
Beck DA, Armen RS, Daggett V. (2005) Cutoff size need not strongly influence molecular dynamics results for solvated polypeptides. *Biochemistry*. 44, 609-16.
Beck DA, Daggett V. (2004) Methods for molecular dynamics simulations of protein folding/unfolding in solution. *Methods*. 34, 112-20
Day R, **Beck DA**, Armen RS, Daggett V. (2003) A consensus view of fold space: combining SCOP, CATH, and the Dali Domain Dictionary. *Protein Sci*. 12, 2150-60.
Beck DA, Alonso DO, Daggett V. (2003) A microscopic view of peptide and protein solvation. *Biophys Chem*. 100, 221-37.

Coe, Kevin
(2002 – 2008)
Mentor: Nelson, S

Wen B, **Coe KJ**, Rademacher P, Fitch WL, Monshouwer M, Nelson SD. (2008) Comparison of in vitro bioactivation of flutamide and its cyano analogue: evidence for reductive activation by human NADPH:cytochrome P450 reductase. *Chem Res Toxicol*. 21, 2393-406.
Wen B, **Coe KJ**, Rademacher P, Fitch WL, Monshouwer M, Nelson SD. (2008) Comparison of in Vitro Bioactivation of Flutamide and Its Cyano Analogue: Evidence for Reductive Activation by Human NADPH:Cytochrome P450 Reductase. *Chem Res Toxicol*. Nov 4.
Coe KJ, Jia Y, Ho HK, Rademacher P, Bammler TK, Beyer RP, Farin FM, Woodke L, Plymate SR, Fausto N, Nelson SD. (2007) Comparison of the cytotoxicity of the nitroaromatic drug flutamide to its cyano analogue in the hepatocyte cell line TAMH: evidence for complex I inhibition and mitochondrial dysfunction using toxicogenomic screening. *Chem Res Toxicol*. 20, 1277-90.
Ho HK, Jia Y, **Coe KJ**, Gao Q, Doneanu CE, Hu Z, Bammler TK, Beyer RP, Fausto N, Bruschi SA, Nelson SD. (2006) Cytosolic heat shock proteins and heme oxygenase-1 are preferentially induced in response to specific and localized intramitochondrial damage by tetrafluoroethylcysteine. *Biochem Pharmacol*. 72, 80-90.
Coe KJ, Nelson SD, Ulrich RG, He Y, Dai X, Cheng O, Caguyong M, Roberts CJ, Slatter JG. (2006) Profiling the hepatic effects of flutamide in rats: a microarray comparison with classical aryl hydrocarbon receptor ligands and atypical CYP1A inducers. *Drug Metab Dispos*. 34, 1266-75.

Day, Ryan
(2000 – 2005)
Mentor: Daggett, V

Day R, Daggett V. (2007) Direct observation of microscopic reversibility in single-molecule protein folding. *J Mol Biol*. 366, 677-86.
Armen RS, Bernard BM, **Day R**, Alonso DO, Daggett V. (2005) Characterization of a possible amyloidogenic precursor in glutamine-repeat neurodegenerative diseases. *Proc Natl Acad Sci U S A*. 102, 13433-8.
Day R, Daggett V. (2005) Ensemble versus single-molecule protein unfolding. *Proc Natl Acad Sci U S A*. 102, 13445-50.
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Hurley, Dana
(2001 – 2004)
Mentor: Sullivan, S

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Mentor: Garrison, L

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(2002 – 2008)
Mentor: Veenstra, D

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(2001 – 2007)
Mentor: Sullivan, S

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Spackman, D. Eldon
(2005 – Present)
Mentor: Sullivan, S

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Strassels, Scott
1997 – 2005)
Mentor: Sullivan, S

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Waweru, Catherine
(2006 – Present)
Mentor: Garrison, L

Waweru C. Antiretroviral prophylaxis to reduce breast-milk HIV-1 transmission. *N Engl J Med*. Oct 23 2008;359(17):1845-1846

Master of Science in Biomedical Regulatory Affairs

Not Applicable

SCHOOL OF PHARMACY

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Graduate Program Review and Self-Study

Table 8

Applicants Admissions & Completion Records During the Past Ten Years

November 2009

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Table 8. Applicants Admissions & Completion Records During the Past Ten Years (2000–2009)

Medicinal Chemistry

Entering Year	Numbers of Applicants			Outcomes of Those Who Enrolled				Reason for Leaving Program (if training was not completed)
					Degree Earned for those who Completed or Left Program			
	Applied (TGE)[1] F/U[2]	Accepted (TGE)[1] F/U[2]	Enrolled (TGE)[1] F/U[2]	Still in Program (TGE)[1] F/U[2]	PhD (TGE)[1] F/U[2]	MS (TGE)[1] F/U[2]	Left Program (TGE)[1] F/U[2]	
2000	21 (8) X/0	7 (5) 1/0	**5** (3) 0/0	0 (0) 0/0	**5** (3) 0/0	0 (0) 0/0	0 (0) 0/0	
2001	48 (17) X/1	10 (8) 3/0	**2** (0) 1/0	0 (0) 0/0	**2** (0) 1/0	0 (0) 0/0	0 (0) 0/0	
2002	31 (15) X/0	8 (7) 4/0	**4** (4) 3/0	**2** (2) 2/0	**2** (2) 1/0	0 (0) 0/0	0 (0) 0/0	
2003	37 (15) X/0	7 (7) 4/0	**2** (2) 1/0	**2** (2) 1/0	0 (0) 0/0	0 (0) 0/0	0 (0) 0/0	
2004	37 (17) X/2	8 (6) 5/0	**6** (4) 4/0	**5** (4) 3/0	0 (0) 0/0	0 (0) 0/0	**1** (0) 1/0	1 Changed career
2005	38 (22) X/0	6 (5) 5/0	**4** (4) 3/0	**4** (4) 3/0	0 (0) 0/0	0 (0) 0/0	0 (0) 0/0	
2006	35 (18) X/3	8 (7) 4/1	**5** (4) 3/1	**5** (4) 3/1	0 (0) 0/0	0 (0) 0/0	0 (0) 0/0	
2007	37 (19) 22/0	7 (6) 5/0	**3** (3) 2/0	**3** (3) 2/0	0 (0) 0/0	0 (0) 0/0	0 (0) 0/0	
2008	52 (23) 26/3	6 (6) 2/1	**3** (3) 1/0	**2** (2) 1/0	0 (0) 0/0	0 (0) 0/0	**1** (1) 0/0	1 Changed career
2009	56 (20) 27/3	4 (4) 2/1	**2** (2) 1/1	**2** (2) 1/1				

X: Unknown

[1]TGE:Training Grant Eligible (US Citizen, Noncitizen National or with a Permanent U.S. Resident Visa)

[2]F:Female

U: Underrepresented minority

Pharmaceutics

Entering Year	Numbers of Applicants			Outcomes of Those Who Enrolled				Reason for Leaving Program (if training was not completed)
					Degree Earned for those who Completed or Left Program			
	Applied (TGE)[1] F/U[2]	**Accepted** (TGE)[1] F/U[2]	**Enrolled** (TGE)[1] F/U[2]	**Still in Program** (TGE)[1] F/U[2]	**PhD** (TGE)[1] F/U[2]	**MS** (TGE)[1] F/U[2]	**Left Program** (TGE)[1] F/U[2]	
2000	52 (8) 22/1	3 (0) 1/0	**2** (0) 0/0	0 (0) 0/0	**2** (0) 0/0	0 (0) X/0	0 (0) X/0	
2001	75 (5) 34/0	4 (1) 3/0	**3** (0) 2/0	0 (0) 0/0	**3** (0) 2/0	0 (0) 0/0	0 (0) 0/0	
2002	51 (13) 26/1	5 (4) 3/1	**5** (3) 3/1	0 (0) 0/0	**3** (0) 3/0	**2** (0) 0/1	0 (0) 0/0	1 Applied for PhD program (accepted 2006)
2003	46 (13) 25/0	7 (6) 1/0	**7** (6) 1/0	**2** (2) 0/0	**3** (2) 1/0	**1** (1) 0/0	**1** (1) 0/0	1 Changed career
2004	40 (13) 23/0	5 (4) 3/0	**5** (4) 3/0	**2** (2) 1/0	**2** (1) 1/0	0 (0) 0/0	**1** (1) 1/0	1 Changed career
2005	36 (15) 20/1	9 (8) 6/0	**3** (2) 2/0	**3** (2) 2/0	0 (0) 0/0	0 (0) 0/0	0 (0) 0/0	
2006	33 (13) 21/0	6 (6) 2/0	**4** (3) 2/0	**4** (3) 2/0	0 (0) 0/0	0 (0) 0/0	0 (0) 0/0	
2007	41 (14) 23/1	9 (6) 6/1	**4** (2) 2/0	**3** (1) 1/0	0 (0) 0/0	**1** (1) 1/0	0 (0) 0/0	
2008	49 (18) 27/2	10 (10) 8/1	**5** (5) 4/1	**6** (6) 5/1	0 (0) 0/0	0 (0) 0/0	0 (0) 0/0	
2009	58 (13) 40/3	7 (7) 5/1	**6** (6) 5/1	**6** (6) 5/1				

[1]TGE:Training Grant Eligible (US Citizen, Noncitizen National or with a Permanent U.S. Resident Visa)
[2]F:Female
U: Underrepresented minority

Pharmaceutical Outcomes Research and Policy Program

Entering Year	Numbers of Applicants			Outcomes of Those Who Enrolled				Reason for Leaving Program (if training was not completed)
					Degree Earned for those who Completed or Left Program			
	Applied (TGE)[1] F/U[2]	**Accepted** (TGE)[1] F/U[2]	**Enrolled** (TGE)[1] F/U[2]	**Still in Program** (TGE)[1] F/U[2]	**PhD** (TGE)[1] F/U[2]	**MS** (TGE)[1] F/U[2]	**Left Program** (TGE)[1] F/U[2]	
2000	24 (7) 8/0	4 (4) 2/0	**4** (4) 2/0	0 (0) 0/0	**3** (3) 1/0	**1** (1) 1/0	0 (0) 0/0	
2001	8 (0) 5/0	2 (0) 1/0	**2** (0) 1/0	0 (0) 0/0	**2** (0) 1/0	0 (0) 0/0	0 (0) 0/0	
2002	26 (5) 12/0	2 (2) 2/0	**2** (2) 2/0	0 (0) 0/0	**2** (2) 2/0	0 (0) 0/0	0 (0) 0/0	
2003	5 (4) 2/0	2 (2) 1/0	**2** (2) 0/0	0 (0) 0/0	**1** (1) 0/0	**1** (1) 0/0	0 (0) 0/0	
2004	16 (4) 6/0	3 (3) 1/0	**3** (3) 1/0	**2** (2) 1/0	0 (0) 0/0	0 (0) 0/0	**1** (1) 0/0	Change in career path/health
2005	13 (1) 5/0	1 (1) 0/0	**1** (1) 0/0	**1** (1) 0/0	0 (0) 0/0	0 (0) 0/0	0 (0) 0/0	
2006	14 (5) 4/0	3 (1) 2/0	**4** (1) 3/0	**3** (1) 2/0	0 (0) 0/0	**1** (0) 1/0	0 (0) 0/0	
2007	11 (4) 5/0	2 (2) 0/0	**2** (2) 0/0	**2** (2) 0/0	0 (0) 0/0	0 (0) 0/0	0 (0) 0/0	
2008	20 (4) 13/0	3 (2) 1/0	**4** (2) 1/0	**4** (2) 1/0	0 (0) 0/0	0 (0) 0/0	0 (0) 0/0	
2009	23 (6) 13/0	3 (3) 1/0	**4** (4) 1/0	**4** (4) 1/0				

[1]TGE:Training Grant Eligible (US Citizen, Noncitizen National or with a Permanent U.S. Resident Visa)
[2]F:Female
U: Underrepresented minority

Master of Science in Biomedical Regulatory Affairs

Entering Year	Numbers of Applicants			Outcomes of Those Who Enrolled				Reason for Leaving Program (if training was not completed)
					Degree Earned for those who Completed or Left Program			
	Applied (TGE)[1] F/U[2]	Accepted (TGE)[1] F/U[2]	Enrolled (TGE)[1] F/U[2]	Still in Program (TGE)[1] F/U[2]	PhD (TGE)[1] F/U[2]	MS (TGE)[1] F/U[2]	Left Program (TGE)[1] F/U[2]	
2000	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
2001	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
2002	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
2003	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
2004	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
2005	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
2006	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
2007	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
2008	31 (28) 15/0	29 (27) 13/0	25 (24) 11/0	21 (20) 9/0	N/A	N/A	4 (4) 2/0	2 – left area due to job 1 – work life balance issues 1 – unknown
2009	34 (29) 25/0	23 (21) 17/0	23 (21) 17/0	23 (21) 17/0	N/A	N/A	N/A	

N/A: not applicable
[1]TGE:Training Grant Eligible (US Citizen, Noncitizen National or with a Permanent U.S. Resident Visa)
[2]F:Female
U: Underrepresented minority

SCHOOL OF PHARMACY

UNIVERSITY *of* WASHINGTON

Graduate Program Review and Self-Study

Table 9

Qualifications of Applicants for the Last Six Years

November 2009

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Table 9. Qualifications of Applicants for the Last Six Years (2004–2009)

Medicinal Chemistry

Year	Previous Institution	Degree(s) & Year(s)	GRE Scores (Percentiles) V	Q	Adv	Undergrad GPA	Interviewed (Y/N)	Accepted (Y/N)	Enrolled (Y/N)
2004									
1	Birla Institute, India	MS 2001	500	570	3.5		N	N	N
2	University Institute, India	BTech 2004	680	780	5.5		N	N	N
3	Benedictine College	BS 2004	400	530	4.5	3.7	N	N	N
4*	Huntington College	BA 2004	580	770	6.0	3.8	Y	N	N
5*	Washington University	BA 2003	580	790	5.0	3.19	N	N	N
6*	Gonzaga University	BS 2004	420	660	4.0	3.27	N	N	N
7*	Cornell University	BA 2004				3.67	N	N	N
8	Bombay College, India	MS 2002	570	730	440		N	N	N
9*	Albertson College	BS 2003	560	600	5.5	3.9	N	N	N
10*	Grand Valley State	BS 2003	390	700	4.5	3.63	Y	Y	Y
11*	Emory University	BA 2004	550	780		3.94	Y	Y	N
12*	Santa Clara University	BS 2002	580	790	5.0	3.56	Y	Y	Y
13	National Taiwan University, Taiwan	BS 2003	570	800	640		N	N	N
14*	University of Maryland	BS 2003	440	670	5.5	3.42	Y	Y	N
15*	Western Kentucky University	MS 2004	670	620	740	3.69	Y	Y	Y
16	Shanghai Institute, China	MS 2004	580	800	740		N	N	N
17**	Pomona College	BA 2002	580	680	4.5	3.4	N	N	N
18	Ewha Women's University, Korea	MS 2000	470	800	690	3.85	Y	Y	Y
19	Peking Union Medical College, China	MS 2004	630	790	710		N	N	N
20	University of Sao Paulo, Brazil	BS 2003	440	620	3.0		N	N	N
21*	University of Washington	BS 2002	380	780	4.5	3.45	Y	N	N
22	Second Military University, China	MS 1996	670	800	730		N	N	N
23	Fudan University, China	BS 2004	710	800	800		N	N	N
24	University of Washington	BS 2004	280	700	3.5	3.5	Y	Y	Y
25*	University of Akron	MS 2002	320	340	3.0	3.0	N	N	N
26	Ohio University	BS 2004				3.47	N	N	N
27*	San Francisco State University	BS 2004					N	N	N
28*	Washington State University	BS 2003	570	720	5.0	3.61	N	N	N
29**	University of Washington	BS 2004	400	560	5.0	3.29	Y	N	N

30*	Santa Clara University	BS 2002	540	750	4.5	3.84	Y	Y	Y
31	East China University	MS 2004	670	800	700		N	N	N
32	Oregon Health & Science University	MS 2003	610	800	750	3.1	N	N	N
33	Changchun Institute, China	PhD 2000	570	770	690		N	N	N
34	Tongii University, China	BS 2003	660	800	800		N	N	N
35	National Tsing Hua University, Korea	MS 2001	370	760	4.0		N	N	N
36	Shenyang Pharmaceutical University, China	MS 2004	720	790	750		N	N	N
37	China Pharmaceutical University, China	B Eng 1999	540	800	4.0		N	N	N
2005									
1*	Virginia Polytechnic Institute	BS 2004	420	670	4.0	2.63	N	N	N
2	Jomo University, Nairobi	BS 2003	710	720	5.0		N	N	N
3	Osmania University, India	MS 2001	500	490	4.0		N	N	N
4*	Indiana University	BS 2004	640	780	5.0	3.7	N	N	N
5	Tianjin University, China	BS 2005	520	790	3.5	3.29	N	N	N
6*	University of Wyoming	BS 2005	420	560	4.5	3.1	N	N	N
7	St. Xavier's College, India	MS 2003	550	770	700		N	N	N
8	University of British Columbia, Canada	MS 2005	570	730	440		N	N	N
9	Shanghai Institute, China	MS 2005	500	800	4.5	3.4	N	N	N
10*	Seattle University	BS 2003	500	700	5.0	3.9	Y	Y	Y
11*	Utah State University	BS 2005	490	650	3.5	3.55	N	N	N
12*	University of Nebraska	BS 2004	510	680	5.0	3.5	N	N	N
13*	University of Puget Sound	BS 2005	450	700	5.5	3.96	Y	Y	Y
14	Seoul National University, Korea	MS 2004	410	710	3.5		N	N	N
15	National Tsing Hua University, Taiwan	MS 2001	590	730	3.0	3.4	N	N	N
16	Korea University, South Korea	MS 1999	430	750	3.5		N	N	N
17	Shenyang Pharmaceutical University, China	MS 2005	660	800	740		N	N	N
18*	University of Wisconsin, River Falls	BS 2005	390	680	3.0	3.87	N	N	N
19*	University of California, Davis	BS 2005	630	700	4.0	3.34	N	N	N
20*	Union College, New York	BS 2005	410	580	4.5	3.25	N	N	N
21*	University of Kansas	BS 2002	660	800	5.5	2.97	Y	Y	Y
22*	University of Chemical Technology and Metallurgy, Bulgaria	MS 1998	310	650	3.5		N	N	N
23*	Gustavus Adophus College	BA 2005	710	770	5.5	3.99	Y	Y	N
24*	Utah State University	MS 2005	500	600	5.0	3.78	N	N	N
25	Shanghai Jiao Tong University, China	BS 2005	410	800	3.5		N	N	N
26*	North Carolina State University	BS 2005	670	800	4.0	3.7	Y	N	N
27*	Baylor University	MS 2005	580	660	760	3.86	N	N	N

28*	Georgia Institute of Technology	BS 2005	470	710	5.5	3.4	N	N	N
29*	University of Washington	MS 2002	610	800	730	3.53	Y	Y	Y
30*	Western Kentucky University	BS 2005	380	710	4.0	3.7	Y	N	N
31	China Pharmaceutical University, China	MS 2005	680	800	780		N	N	N
32*	University of Wisconsin, Whitewater	BS 2002	450	760	5.5		N	N	N
33	Peking University, China	MS 2004	670	800	630		N	N	N
34*	Kalamazoo College	BA 2003	530	720	590	3.0	Y	Y	N
35*	Southeastern Louisiana University	BS 2005	440	670	4.5	3.1	N	N	N
36	University of Arizona	MS 2005	700	800	800	4.0	N	N	N
37	Shanghai Institute, China	MS 2005	500	800	4.0		N	N	N
38	Purdue University	MS 2005	680	800	700	3.1	N	N	N
2006									
1	University of Washington	BS 2004	470	740	4.0	3.0	N	N	N
2*	Virginia Polytechnic Institute	BS 2006	310	710	4.0	3.1	N	N	N
3	Tsinghua University, China	MS 2006	480	800	3.5		N	N	N
4	University of Alaska	MS 2006	480	670	4.0	3.3	N	N	N
5*	Central Washington University	MS 2006	380	580	4.0	3.7	N	N	N
6*	Colorado College	BA 2002	580	660	3.5	3.09	Y	N	N
7*	Utah State University	BS 2006	440	630	4.5	3.88	Y	Y	N
8*	University of Washington	BS 2005	600	740	4.5	3.81	Y	N	N
9*	University of Houston	BS 2001	430	600	3.5	2.98	N	N	N
10	National Taiwan University	BS 2006	320	550	4.0		N	N	N
11**	University of South Florida	BS 2006	410	700	4.0	3.5	N	N	N
12	Chosun University, South Korea	MS 2005	490	800	5.0		N	N	N
13	Smriti College, India	BS 2006	500	800	4.5		N	N	N
14**	York College	BS 2006	380	480	3.5	2.76	N	N	N
15*	University of Washington	BS 2004	510	650	5.5	3.24	Y	Y	Y
16*	Colorado School of Mines	BS 2006				2.92	N	N	N
17	SNDT, India	MS 2004	590	730	670		N	N	N
18*	University of California, San Diego	BS 2006	620	770	5.5	3.23	Y	Y	N
19*	Emory University	BS 2006	600	690	5.0	3.54	Y	Y	N
20	Madras Medical College, India	BS 2006	590	780	4.5		N	N	N
21	University of Oregon	BS 2006	550	610	4.0	3.7	N	N	N
22*	Seattle Pacific University	BS 2006	550	680	4.5	3.48	N	N	N
23*	Central Washington University	BS 2006	390	440	4.5	3.2	N	N	N
24*	Brown University	MA 2005	620	750	690	2.83	Y	Y	Y
25*	Montana State University	BS 2005	450	710	3.5	3.0	N	N	N

26	Mumbai University, India	BTECH 2003	640	780	3.5		N	N	N
27	University of Guelph, Canada	BS 2006	310	800	4.0	3.2	N	N	N
28	Peking University, China	MS 2006	490	800	3.5		N	N	N
29	Peking Medical College, China	MS 2004	620	800	800		N	N	N
30*	Alma College	BS 2006	590	700	5.5	3.47	Y	Y	Y
31	Peking University, China	MS 2006	600	800	5.0	3.6	N	N	N
32	Shanghai Institute, China	MS 2002	600	800	4.5		Y	Y	Y
33	Fudan University, China	BS 2006	610	760	4.5	3.78	N	N	N
34	University of Singapore, Singapore	MS 2005	680	800	740		N	N	N
35**	Regis University	BS 2001	400	610	4.0	3.5	Y	Y	Y
2007									
1	Gazi University, Turkey	MS 2007	290 4%	640 57%	2.5 2%		N	N	N
2	China Pharmaceutical University, China	BS 2007	620 88%	790 91%	3.5 17%		N	N	N
3*	University of Washington	PharmD 2008	390 28%	670 64%	4.5 52%	3.74	Y	Y	Y
4*	College of New Jersey	BS 2006	460 48%	800 94%	4.0 32%	3.73	N	N	N
5	University College Dublin, Ireland	BS 2007	600 85%	610 49%	5.5 87%		N	N	N
6*	University of Washington	BS 2000	730 99%	650 59%	5.5 87%	3.25	N	N	N
7*	San Francisco State University	BS 2007	420 37%	670 64%	4.5 52%	3.94	Y	Y	Y
8*	Purdue University	BS 2007	440 43%	510 28%	3.5 17%	2.4	N	N	N
9	J.S.S. College of Pharm, India	BPharm 2006	610 87%	710 73%	4.0 32%		N	N	N
10*	University of Washington	BS 2005	580 81%	720 75%	6.0 96%	3.43	Y	Y	Y
11	National Institute Pharmaceutical Education & Research, India	MS 2007	550 73%	740 80%	3.5 17%		N	N	N
12*	University of Utah	BS 2007	620 88%	760 85%	4.5 52%	3.78	Y	Y	N
13*	Texas A&M University	BS 2006	450 45%	670 64%	4.5 52%	3.77	N	N	N
14*	Gustavus Adolphus College	BA 2007	510 62%	730 78%	4.5 52%	3.7	Y	Y	N

15*	College of St. Benedict	BA 2006	460 48%	710 73%	4.0 32%	3.3	N	N	N
16*	Illinois Institute of Technology	BS 2004	580 81%	780 89%	5.0 71%	3.88	N	N	N
17	Seattle Pacific University	BS 2007	360 20%	760 85%	4.0 32%	3.62	N	N	N
18	National Taiwan University, Taiwan	MS 2005	290 4%	610 48%	2.5 2%		N	N	N
19*	University of San Diego	BA 2007	590 83%	790 91%	6.0 96%	3.91	Y	Y	Y
20	Hunan University, China	BS 2006	590 83%	800 94%	4.0 32%		N	N	N
21*	University of California, Davis	BS 2003	640 90%	680 64%	5.5 86%	2.59	N	N	N
22	National University Singapore, Singapore	MS 2007	670 95%	800 97%	780 96%		N	N	N
23	Beijing University, China	MS 2007	460 48%	790 89%	3.5 17%		N	N	N
24*	University of Washington	BS 2005	410 34%	800 94%	4.0 32%	3.54	N	N	N
25	East China University, China	BS 2006	300 5%	800 94%	4.0 32%		N	N	N
26	University of Michigan	BS 2007	330 13%	670 64%	4.0 32%	3.1	N	N	N
27*	University of Colorado Health Sciences	PharmD 2007	510 62%	600 47%	6.0 96%	3.42	Y	Y	N
28	College of Idaho	BS 2007	570 78%	780 89%	3.0 7%	3.88	N	N	N
29	Mumbai University, India	Btech 2003	640 90%	780 90%	3.5 18%		N	N	N
30	Wuhan University, China	BS 2007	440 43%	800 94%	3.5 17%		N	N	N
31	China Pharmaceutical University, China	BS 2007	410 31%	790 91%	5.0 71%		N	N	N
32	Academy of Military Med Sciences, China	MS 2007	490 57%	770 87%	4.5 52%		N	N	N
33	National University of Singapore, Singapore	BS 2007	550 73%	750 82%	5.5 87%		N	N	N
34	China Pharmaceutical University, China	BS 2007	550 73%	790 91%	5.0 71%		N	N	N

35	Capital University Beijing, China	BS 2007	500 60%	800 94%	4.5 52%		N	N	N
36	Institute Med Biotech, China	MS 2007	610 87%	800 94%	4.5 52%		N	N	N
37*	Georgetown University	BS 2006	550 73%	710 73%	5.0 71%	3.76	Y	Y	Y
2008									
1	King Saud University, Saudi Arabia	BS 2007	210 1%	470 22%	3.0 7%		N	N	N
2	King Saud. University, Saudi Arabia	BS 2007	350 18%	410 14%	3.0 7%		N	N	N
3	Institute of Chemical Technology, India	BTech 2008	560 76%	800 94%	5.0 71%		N	N	N
4	King Abdul University, Saudi Arabia	PharmD 2007	270 2%	560 40%	2.5 2%		N	N	N
5*	Moorhead State University	BA 2008	650 93%	720 77%	4.0 33%	3.49	Y	Y	N
6*	University of Arkansas	BS 2007	540 71%	620 53%	4.0 33%	3.4	N	N	N
7*	University of Arizona	BS 2008	510 63%	720 77%	4.5 54%	3.3	Y	Y	Y
8	National Taiwan University, Taiwan	MS 2005	540 70%	790 91%	3.5 17%		Y	N	N
9	National Central University, Taiwan	MS 2005	500 60%	790 92%	3.5 18%		N	N	N
10	Mahidol University, Thailand	BS 2007	310 8%	720 77%	3.0 7%		N	N	N
11*	University of California, Berkeley	BS 2007	390 28%	640 58%	4.5 54%	3.43	Y	N	N
12**	University of California, Berkeley	BS 2005	500 60%	620 53%	4.0 33%	3.38	Y	N	N
13*	Indiana University	BS 2002	490 57%	750 84%	5.0 73%	3.46	N	N	N
14	Gazi University, Turkey	MS 2007	280 3%	780 90%	4.0 33%		N	N	N
15*	Seattle University	BS 2007	530 68%	730 79%	4.5 54%	3.44	N	N	N
16*	Rice University	BS 2008	520 65%	750 84%	3.5 18%	3.11	Y	N	N

17	Bombay College, India	MS 2008	370 23%	800 94%	4.0 33%		N	N	N
18	China Pharmaceutical University, China	BS 2008	610 87%	780 90%	4.5 54%		N	N	N
19	Peking University Health Sciences, China	BS 2008	460 49%	800 94%	3.0 7%		N	N	N
20	Peking University, China	MS 2008	520 65%	800 94%	4.0 33%		N	N	N
21*	University of Arizona	BS 2008	470 52%	580 44%	4.0 33%	3.35	N	N	N
22*	Kettering University	BS 2007	480 55%	580 44%	3.0 7%	3.27	N	N	N
23*	University of Washington	BS 2007	620 89%	780 90%	4.0 33%	3.33	Y	Y	Y
24	Delhi Institute, India	BS 2008	600 85%	710 74%	4.5 54%		N	N	N
25	Korea University, South Korea	MS 2000	570 79%	800 94%	3.0 7%		N	N	N
26*	Worcester State	BS 2007	400 31%	540 35%	3.5 18%	3.51	N	N	N
27	National Taiwan University, Taiwan	BS 2005	400 31%	800 92%	4.0 31%		N	N	N
28	Peking University, China	BS 2008	480 55%	750 84%	4.0 33%		N	N	N
29	University of Washington	BS 2005	610 87%	780 90%	3.5 18%	3.54	N	N	N
30*	St. Olaf College	BS 2008	490 57%	690 70%	4.5 54%	3.36	Y	Y	N
31**	San Francisco State University	MS 2008	330 13%	520 31%	4.0 33%	3.85	Y	Y	N
32	Tehran Azad University, Iran	MS 2008	290 4%	720 77%	3.0 7%		N	N	N
33*	University of California, Santa Barbara	BS 2007	500 60%	670 66%	4.5 54%	3.02	N	N	N
34*	California Polytechnic State University	BS 2007	540 71%	710 74%	4.5 54%	3.45	N	N	N
35*	University of Arizona	BS 2008	710 98%	710 74%	4.5 54%	3.76	Y	Y	Y
36**	Sheffield Hallam University, UK	BS 2007	260 1%	560 40%	2.5 2%		N	N	N

37*	University of California, Davis	BS 2004	420 37%	700 70%	4.0 32%	2.8	N	N	N
38*	University of Puget Sound	BS 2007	390 28%	550 37%	4.0 33%	3.15	N	N	N
39	China Pharmaceutical University, China	BS 2008	580 81%	800 94%	4.5 52%		N	N	N
40	Shenyang Pharmaceutical University, China	BS 2007	470 51%	770 87%	3.5 17%		N	N	N
41	Uppsala University, Sweden	BS 2008	500 60%	760 85%	5.0 71%		N	N	N
42	Birla Institute, India	MS 2007	470 52%	770 88%	4.5 54%		N	N	N
43	Peking University, China	MS 2008	420 37%	800 94%	3.0 7%		N	N	N
44	University of Delhi, India	MS 2006	500 60%	800 94%	4.0 32%		N	N	N
45	Institute of Chemical Technology, India	BTech 2008	410 34%	800 94%	4.5 54%		N	N	N
46*	University of Northern Colorado	BA 2005	480 55%	650 61%	4.0 33%	3.39	N	N	N
47	Dickinson State University	BS 2007	320 10%	650 61%	3.5 18%	3.78	N	N	N
48	China Pharmaceutical University, China	BS 2008	490 57%	780 90%	3.5 18%		N	N	N
49	North China University, China	BS 2003	550 73%	800 94%	3.5 18%		N	N	N
50	China Pharmaceutical University, China	BS 2008	550 73%	800 94%	3.5 18%		N	N	N
51	Tongji Medical College, China	BS 2008	470 52%	800 94%	3.5 18%		N	N	N
52	Beijing University of Technology, China	BS 2007	520 65%	800 94%	3.5 17%		N	N	N
2009									
1*	Emory University	BA 1997	630 90%	590 46%	5.5 88%	3.83	N	N	N
2	King Saud. University, Saudi Arabia	BS 2008	310 9%	650 60%	3.0 8%		N	N	N
3	Azad University, Iran	MS 2000	280 3%	490 26%	2.0 1%		N	N	N

4	King Abdul University, Saudi Arabia	PharmD 2007	430 41%	740 81%	2.5 3%		N	N	N
5*	Moorhead State University	BS 2009	390 30%	720 76%	4.0 37%	3.72	N	N	N
6*	Drury University	BA 2009	600 85%	730 79%	5.0 77%	3.87	N	N	N
7	National Taiwan University, Taiwan	MS 2005	540 70%	790 91%	3.5 17%		Y	N	N
8	University of Iowa	BS 2007	620 89%	760 86%	3.0 8%	3.34	N	N	N
9	Shandong University, China	MS 2008	490 58%	790 92%	3.0 8%		N	N	N
10	National Chung-Hsing University, Taiwan	MS 2004	250 31%	670 84%	 %		N	N	N
11	Bombay College of Pharmacy, India	MS 2009	510 64%	700 72%	4.0 37%		N	N	N
12	Peking University Health Sciences, China	BS 2009	470 52%	800 94%	4.0 33%		N	N	N
13*	Ft. Lewis College	BS 2008	450 47%	600 48%	3.5 20%	3.58	N	N	N
14*	Wagner College	BS 2009	520 66%	630 55%	5.0 77%		N	N	N
15**	University of California, Santa Cruz	BS 2009	440 44%	560 40%	4.5 58%	3.0	Y	Y	Y
16	Fudan University, China	BS 2009	590 83%	790 92%	5.0 77%		N	N	N
17	East China University, China	MS 2006	340 17%	790 92%	3.0 8%		N	N	N
18*	State University of New York, Buffalo	BS 2009	390 30%	700 72%	5.0 77%	3.08	N	N	N
19**	California State University, Fullerton	BS 2008	440 44%	560 40%	3.5 20%	3.2	Y	N	N
20	Fudan University, China	BS 2009	660 94%	800 94%	3.5 20%		N	N	N
21	China Pharmaceutical University, China	BS 2009	440 56%	800 92%	3.0 6%		N	N	N
22	Makerere University, Uganda	BPharm 2006					N	N	N
23	Korea University, Korea	MS 2000	570 79%	800 94%	3.0 8%		N	N	N

24*	University of Colorado, Boulder	BS 2009	340 17%	800 94%	3.5 20%	3.52	Y	N	N
25	Seoul National University, South Korea	MS 2007	340 17%	730 79%	3.0 8%		N	N	N
26	China Pharmaceutical University, China	BEngr 2009	430 41%	800 94%	3.5 20%		N	N	N
27	Peking University, China	MS 2008	370 25%	730 79%	3.0 8%		N	N	N
28	Sichuan University, China	BS 2006	480 55%	800 94%	4.0 33%		N	N	N
29	Fudan University, China	BS 2009	290 4%	770 88%	3.5 18%		N	N	N
30	National Taiwan University, Taiwan	MS 2005	320 12%	690 69%	3.0 8%		N	N	N
31	China Pharmaceutical University, China	BS 2009	500 61%	800 94%	3.5 20%		N	N	N
32**	Georgia State University	MS 2006	330 14%	620 53%	3.5 20%	3.8	N	N	N
33	Shanghai Institute, China	MS 2008	530 68%	750 83%	4.0 37%		N	N	N
34	Cairo University, Egypt	BS 2006	560 76%	700 72%	3.0 7%		N	N	N
35	Virginia Commonwealth University	MS 2009	640 91%	640 57%	4.0 32%		N	N	N
36*	Grinnell College	BA 2009	600 85%	680 67%	4.5 58%	3.63	Y	Y	Y
37*	Moorhead State University	BA 2009	470 53%	710 74%	3.5 20%	3.89	N	N	N
38*	University of Washington	BS 2009	360 22%	480 24%	3.0 8%	3.0	N	N	N
39*	Hamline University	BS 2009	550 74%	640 58%	5.5 90%	3.1	N	N	N
40	Washington University	MA 2007	440 44%	790 92%	3.5 20%	3.3	N	N	N
41	University of Pennsylvania	MS 2009	640 91%	760 85%	4.0 32%		N	N	N
42*	Eastern Michigan University	BS 2009	600 85%	730 79%	4.0 7%	4.0	Y	Y	N
43	Tianjin Medical University, China	MS 2008	480 55%	790 92%	 %		N	N	N

44	China Pharmaceutical University, China	BENGR 2009	480 55%	800 94%	3.5 20%		N	N	N
45*	University of South Florida	PhD 1995	330 13%	430 16%	3.0 7%	3.8	N	N	N
46*	Worcester Polytechnic Institute	BS 2009	540 71%	630 55%	5.0 77%	3.14	N	N	N
47*	University of Washington	BS 2009	720 98%	760 86%	5.0 77%	3.07	Y	N	N
48*	University of California, Davis	BS 2006	500 60%	670 66%	4.0 33%	3.34	Y	Y	N
49*	Mankato State University	BS 2009	600 85%	770 88%	5.5 88%	3.93	N	N	N
50	Fudan University, China	BS 2009	510 64%	800 94%	4.0 37%		N	N	N
51	Tongi University, China	BS 2008	560 76%	800 94%	3.0 7%		N	N	N
52	University of Georgia	MS 2008	460 50%	770 88%	3.0 8%	3.17	N	N	N
53	University of Chinese Academy of Sciences, China	MS 2007	470 52%	790 92%	3.0 8%		N	N	N
54	Nanjing University, China	BENGR 2009	440 44%	790 92%	3.5 20%		N	N	N
55	National Sun Yat-Sen University, Taiwan	MS 2006	390 30%	790 92%	3.0 8%		N	N	N
56	Peking University, China	MS 2008	480 55%	800 94%	3.5 20%		N	N	N

*Training grant eligible
**Under-represented minority TGE applicants

Pharmaceutics

Year	Previous Institution	Degree(s) & Year(s)	GRE Scores V (Percentiles)	GRE Scores Q (Percentiles)	GRE Scores Adv (Percentiles)	Undergrad GPA	Interviewed (Y/N)	Accepted (Y/N)	Enrolled (Y/N)
Data from 2004 – 2006 not available due to record maintenance schedule (destroyed after 2 years)									
2007									
1	Purdue University	MS 2007	540 70%	800 92%	4.5 47%	3.82	Y	Y	Y
2*	University of Pittsburgh	PharmD 2007	650 92%	720 75%	5 71%	3.57	Y	Y	Y
3	Sichuan University, China	BS 2007	520 65%	800 94%	45 52%	3.95	Y	Y	Y
4* MS Degree	University of Washington	BS 2007	450 46%	600 49%	40 33%	3.3	Y	Y	Y
5*	State University of New York, Buffalo	BS 2007	550 73%	770 87%	5.0 71%	3.63	Y	Y	N
6*	University of Kansas	PharmD 2007	650 95%	590 61%	4.0 32%	3.21	Y	Y	N
7*,**	Notre Dame de Namur University	BS 2003	470 51%	560 8%	4.0 32%	3.3	Y	Y	N
8	University of Toronto, Canada	BS 2007	660 93%	760 85%	4.0 32%	3.85	Y	Y	N
9* PharmD/ PhD	Boston College	BS 1996				3.5	Y	N	N
10*	Massachusetts Institute of Technology	BS 2002	490 57%	740 80%	4.5 52%	2.7	Y	N	N
11*	North Carolina State University	BENGR 2005	510 62%	760 82%	4.5 52%	3.56	Y	N	N
12*	University of California, Santa Barbara	BS 2007	620 88%	730 78%	4.5 52%	3.3	Y	N	N
13*	University of California, Santa Cruz	BS 2007	390 28%	670 64%	4.0 32%	3.54	Y	N	N
14	Nanjing University, China	MS 2005	520 64%	800 92%	5.0 71%	3.97	Y	N	N
15	Peking University, China	BS MS 2007	460 48%	800 94%	4.0 32%	3.7	Y	N	N

16*	University of Washington	BS 2001	530 67%	780 89%	4.5 52%	3.03	Y	N	N
17	Oregon Health Science University	MS 2006	420 36%	740 79%	4.0 28%	3.5	N	N	N
18	Fudan University, Shanghai, China	BS 2006	450 45%	780 87%	3.5 16%	3.0	N	N	N
19	Shanghai Jiao Tong University, China	BS 2007	470 51%	780 89%	3.5 17%	3.31	N	N	N
20	National Taiwan University, Taiwan	BS 2007	520 65%	790 91%	3.5 17%	4.0	N	N	N
21	University of Missouri Kansas City	BS 2007	670 95%	750 82%	4.0 32%	3.09	N	N	N
22	Sichuan University, China	MS 2007	550 72%	800 92%	4.0 31%	3.6	N	N	N
23	Peking University, China	MS 2007	530 67%	800 94%	3.0 7%	3.8	N	N	N
24	University of Toronto, Canada	BS 2006	600 85%	800 94%	4.5 52%	3.6	N	N	N
25	Nanjing University, China	MS 2005	520 64%	800 92%	5 71%	3.8	N	N	N
26	Nanjing University, China	MS 2004	720 98%	780 89%	730 87%	3.5	N	N	N
27	China Pharmaceutical University, China	MS 2005	680 80%	790 90%	710 80%	3.3	N	N	N
28	Government College of Pharmacy, India	MS 2006	550 73%	730 78%	3.5 15%	3.75	N	N	N
29	Siddhartha College of Pharmaceutical Sciences, India	MS 2007	420 36%	540 35%	2.5 2%		N	N	N
30	Tongji Medical University, China	BS 2006	460 48%	770 85%	3.5 16%	3.42	N	N	N
31	Shanghai Institute of Pharmaceutical Industry, China	MS 2004	470 51%	790 91%	3.5 17%	3.6	N	N	N
32	Eastern Illinois University	BS 2007	400 40%	700 60%	2.5 10%	3.2	N	N	N
33	University of Waterloo, Canada	BENGR 2006					N	N	N
34*	University of Utah	BS 2007	620 88%	760 85%	4.5 52%	3.8	N	N	N
35	Peking University, China	MS 2007	460 48%	800 94%	4.0 32%	3.7	N	N	N
36	National Taiwan University, Taiwan	BS 2005				3.7	N	N	N
37	Shandong University, China	BS 2006	350 18%	780 87%	3.5 17%	3.5	N	N	N

38	Shanghai Jiao Tong University, China	BA 2004	410 33%	690 66%	4.5 52%	3.83	N	N	N
39*	University of Wisconsin, Madison	BS 2006	480 54%	690 68%	4.5 52%	3.45	N	N	N
40*	University of Minnesota, Minneapolis	BS 2003	470 51%	640 57%	5.0 71%	3.09	N	N	N
41	Baylor College of Medicine	MS 2007	650 92%	800 92%	800 97%	3.5	N	N	N
42	Cairo University, Egypt	BS 2002	620 87%	790 89%	3.0 7%	4.0	N	N	N
43	PSG College of Technology, Anna University Coimbatore, India	BTECH 2007	670 95%	800 94%	4.5 52%	3.7	N	N	N
2008									
1* PharmD/ PhD	University of Washington	BS 2006	510 64%	600 48%	45 58%	3.39	Y	Y	Y
2*,**	University of Washington	BS 2005	720 98%	650 60%	4 37%	3.07	Y	Y	Y
3*	Case Western Reserve University	BS 2008	500 60%	770 88%	4 33%	3.61	Y	Y	Y
4*	Purdue University	BS 2003	550 73%	640 57%	4 32%	2.75	Y	Y	Y
5*	State University of New York, Buffalo	MS 2008	500 60%	700 72%	4 33%	3.2	Y	Y	Y
6* PharmD/ PhD	University of Wisconsin, Madison	BENGR 1998				4.0	Y	Y	N
7*	Kansas State University	BS 2008	500 60%	760 86%	4.0 33%	3.97	Y	Y	N
8*	University of Wisconsin, Madison	BS 2008	560 76%	770 88%	5.5 88%	3.45	Y	Y	N
9*	University of California, Los Angeles	BS 2004	480 55%	600 49%	4.5 54%	3.6	Y	Y	N
10*	University of Michigan	PharmD 2004	650 93%	790 92%	5 73%	3.8	Y	Y	N
11	University of Pennsylvania	MS 2006	500 59%	800 92%	3.5 14%	3.3	Y	N	N
12	University of Minnesota, Minneapolis	MS 2004	690 96%	770 88%	5 73%	3.42	Y	N	N
13	University of Pennsylvania	MS 2007	550 74%	750 83%	3 8%	3.1	Y	N	N

14	Tsinghua University, China	BS 2007	570 76%	790 91%	3.5 17%	85.8	Y	N	N
15*	University of Puget Sound	BS 2007	390 28%	550 37%	4 33%	3.15	Y	N	N
16* PharmD/ PhD	University of California, San Diego	BS 2005	610 87%	640 58%	4.5 54%	3.87	Y	N	N
17*	Northwestern University	MS 2007	460 49%	690 70%	5 73%	3.22	Y	N	N
18*,**	University of New Orleans	BA 1999	310 8%	420 15%	25 2%	3.21	Y	N	N
19*	University of Florida	BS 2008	550 73%	770 88%	4.5 54%	3.79	Y	N	N
20*	University of Texas, Arlington	BS 2007	650 93%	670 66%	5 88%	2.4	Y	N	N
21	Azad University, Iran	MS 2000	280 3%	490 26%	20 1%	2.05	N	N	N
22	Eastern Illinois University	MS 2007	400 40%	700 60%	2.5 10%	3.7	N	N	N
23	MAEER'S Maharashtra Institute of Pharmacy, India	BS 2008	490 57%	740 82%	4.5 54%		N	N	N
24*	Fudan University, China	BS 2006	450 45%	780 89%	3.5 17%	3.21	N	N	N
25	Tzu Chi University, Taiwan	MS 2001	290 4%	790 92%		2.59	N	N	N
26	Seoul National University, Korea	MS 2005	520 65%	800 94%	4.5 52%	3.38	N	N	N
27	Northeastern University	MS 2008	410 33%	700 68%		3.1	N	N	N
28	Capital Normal University, China	MS 2008	480 54%	800 94%	4 32%		N	N	N
29	China Pharmaceutical University, China	BS 2008	440 43%	800 94%	4 33%	87	N	N	N
30	Bombay College of Pharmacy, India	BS 2008	650 93%	760 86%	4.5 54%		N	N	N
31	Zhejiang University, China	MS 2006				3.2	N	N	N
32*	Cairo University, Egypt	BS 2000	470 52%	750 84%	4 33%		N	N	N
33*	Osmania University, India	BS 2007					N	N	N

34	Pukyong National University, South Korea	MS 2006	510 63%	750 84%	3 7%	3.44	N	N	N
35	Peking University, China	MS 2007	380 26%	770 88%	3.5 18%		N	N	N
36	Bombay College of Pharmacy, India	BS 2008	380 26%	670 66%	4 33%		N	N	N
37	Peking University Health Science Center, China	BS 2004	530 68%	780 90%	3.5 18%	3.55	N	N	N
38	J.S.S.College of Pharmacy, Mysore, India	BS 2007	350 18%	660 63%	3 7%		N	N	N
39	Texas Woman's University	BS 2008	320	700	3.5		N	N	N
40	Colorado State University	MS 2008	350 18%	780 87%	3.5 16%	85.5	N	N	N
41	Long Island University, Brooklyn, NY	MS 2008	400 31%	670 62%	3.5 17%	3.9	N	N	N
42	Sarojini Naidu Vanitha Pharmacy Mahavidyalaya, India	BS 2006	360 21%	710 74%	3.5 18%	3.3	N	N	N
43	Delhi Institute of Pharmaceutical Sciences & Research, India	BS 2008	640 91%	800 94%	3.5 18%		N	N	N
44	HSNCB'S College of Pharmacy, India	BS 2008	410	570			N	N	N
45	R.C.Patel College of Pharmacy, India	MS 2007	290 36%	590 74%			N	N	N
46	Konkuk University, South Korea	BS 2007	630 90%	770 88%	3 7%	3.35	N	N	N
47	Zhongshan, Sun Yat-sen University, China	BS 2008	460 49%	780 90%	4.5 54%	3.7	N	N	N
48	Creighton University	MS 2007	450 45%	770 87%	3 7%	3.3	N	N	N
49	Peking University Health Science Center, China	BS 2008	340 15%	770 88%	3 7%	3.1	N	N	N
50	China Pharmaceutical University, China	BS 2008	550 73%	800 94%	3.5 18%	84	N	N	N
2009									
1*	University of Washington	BS 2004	580 81%	740 81%	5.5 90%	3.97	Y	Y	Y
2*,**	University of California, Santa Cruz	BS 2009	520 66%	670 65%	5 77%	3.59	Y	Y	Y
3*	University of Washington	BS 2009	460 50%	710 74%	5 77%	3.65	Y	Y	Y

4*	Ashland University	BS 2007	480 55%	640 58%	4.5 58%	3.87	Y	Y	Y
5*	University of California, Irvine	BS 2008	420 38%	640 58%	5 77%	3.12	Y	Y	Y
7* MS Degree	Georgia Institute of Technology	PhD 2006	570	780	750	3.5	Y	Y	Y
6*	College of Holy Cross	BA 2006	490 58%	750 83%	4 37%	3.11	Y	Y	N
8*	Sacramento City College	BS 2003	630 90%	710 74%	5 77%	3.03	Y	N	N
9*	Harvey Mudd College	BS 2009	710 98%	800 94%	5.5 90%	3.69	Y	N	N
10	National Taiwan University, Taiwan	MS 2009	560 77%	780 90%	3.5 20%	4.0	Y	N	N
11*	Marquette University	BS 2005	480 53%	620 59%	4.5 51%	3.5	Y	N	N
12*	University of Maryland	MS 2009	680 96%	800 94%	3.5 20%	3.3	Y	N	N
13*,**	University of Maryland	BS 2002	450 46%	590 46%	4.5 54%	3.1	Y	N	N
14	University of Missouri, Kansas City	MS 2009	640 80%	800 99%	4.5 80%	3.0	N	N	N
15	China Pharmaceutical University, China	BS 2009	530 68%	800 94%	4 33%	4.0	N	N	N
16	Butler University	MS 2009	530 67%	590 43%	2.5 2%	3.8	N	N	N
17	Southeast University, China	MPE 2009	340 15%	770 88%	3 7%	3.4	N	N	N
18*	University of Connecticut	BS 2007	320 40%	630 78%	3 50%	3.05	N	N	N
19	King's College London, UK	MS 2009	540 71%	730 79%	3.5 20%		N	N	N
20*,**	State University of New York, Buffalo	BS 2009	300 7%	690 69%	2.5 3%	3.2	N	N	N
21*	State University of New York, Geneseo	BS 2006	500 61%	670 65%	4 37%	2.9	N	N	N
22	Huazhong University of Science & Technology, China	BS 2008	520 66%	750 83%	3 8%	3.77	N	N	N
23	Manipal College of Pharmaceutical Sciences, India	MS 2006	450 47%	750 83%	3.5 20%	72.5	N	N	N

24	Dehli Institute of Pharmaceutical Sciences and Research, India	OTHMA 2008	580 81%	670 65%	3.2 20%		N	N	N
25	Ewha Womans University, Korea	BS 2009	470 53%	800 94%	3.5 20%	3.56	N	N	N
26	Zhengzhou University, China	BS 2009	550 74%	790 92%	4 37%	3.6	N	N	N
27*	Nanjing University of Technology, China	BENGR 2008	580 81%	800 94%	4.5 54%	3.7	N	N	N
28	Rajiv Gandhi University-AMCP, India	BS 2008	250 1%	680 67%			N	N	N
29	University of Washington	BS 2009	290 5%	690 69%	2 1%	2.89	N	N	N
30	A.S.N. Pharmacy College, India	BS 2009	330 41%	770 96%	3 50%	3.75	N	N	N
31	Hubei University of Chinese Medicine, China	BS 2009	510 64%	800 94%	2.5 3%	87	N	N	N
32	Peking University Health Science Center, China	BS 2009	520 66%	760 86%	3.5 20%	3.4	N	N	N
33	Kaohsiung Medical University, Taiwan	BS 2007	530 68%	740 81%	3.5 20%	3.83	N	N	N
34	Shandong University, China	BS 2008	420 38%	700 72%	3 8%	3.04	N	N	N
35	Fudan University, China	BS 2009	470 53%	690 69%		3.07	N	N	N
36	Zhejiang University, China	BS 2008	510 63%	670 66%	4 33%	3.5	N	N	N
37	University of Houston	BS 2008	520 70%	780 90%	5 73%	3.7	N	N	N
38	Oregon State University	MS 2007	380 26%	770 88%	3.5 18%		N	N	N
39	Sichuan University, China	BS 2009	350 20%	680 67%	3.5 20%	3.3	N	N	N
40	Institute of Chemical Technology, India	BTECH 2008	690 96%	730 79%	4 37%	63.4	N	N	N
41	Idaho State University	MS 2009	590 82%	680 64%	4.5 51%	3.99	N	N	N
42	University of Pune, India	BS 2003	330 14%	340 7%	3 8%	3.7	N	N	N
43*	Merritt College	BA 2005	590 83%	780 90%	4.5 54%	2.7	N	N	N

44*	Boston University	BA 2009	430 41%	640 58%	4.5 58%	2.23	N	N	N
45	Chulalongkorn University, Thailand	BS 2009	350 20%	710 74%	2.5 3%	3.31	N	N	N
46	C U Shah College of Pharmacy, India	MS 2004	470 53%	680 67%	3.5 20%		N	N	N
47	Shanghai Jiao Tong University, China	MS 2009	520 65%	800 94%	4 33%	84	N	N	N
48	Konkuk University, South Korea	BS 2007	630 90%	770 88%	3 7%	3.35	N	N	N
49	Idaho State University	MS 2009	480 55%	690 69%	4 37%		N	N	N
50	Oregon State University	MS 2009	530 67%	800 94%	3.5 17%	3.4	N	N	N
51	China Pharmaceutical University, China	BS 2003	530 67%	780 89%	17 17%		N	N	N
52*	Harvard University	BA 2005	590 83%	740 81%	4.5 58%	2.38	Y	N	N
53	Shandong University, China	BS 2009	390 30%	800 94%	3.5 20%	100	N	N	N
54	Peking University, China	MS 2009	500 60%	800 94%	4 33%	3.5	N	N	N
55	Sichuan University, China	BS 2009	370 25%	790 92%	3 8%	3.4	N	N	N
56	Fudan University, China	BS 2009	500 60%	800 94%	3.5 18%	3.02	N	N	N
57	China Pharmaceutical University, China	BS 2009	510 64%	700 72%	3.5 20%	3.3	N	N	N
58	Tongji Medical College of Huazhong University of Science and Technology, China	BS 2008	470 52%	800 94%	3.5 18%	86	N	N	N
59	Misr International University, Egypt	BS 2006	420 37%	730 79%	4 33%	3.32	N	N	N

*Training grant eligible
**Under-represented minority TGE applicants

Pharmaceutical Outcomes Research and Policy Program

Year	Previous Institution	Degree(s) & Year(s)	GRE Scores V (Percentiles)	GRE Scores Q (Percentiles)	GRE Scores Adv (Percentiles)	Undergrad GPA	Interviewed (Y/N)	Accepted (Y/N)	Enrolled (Y/N)
2004									
1	Taiwan, University Pittsburgh	BS 2001 MHA 2004	590 85%	800 92%	640		Y	N	N
2	Taiwan, Harvard	BS 2001 MS 2004	420 36%	790 91%	770	3.58	N	N	N
3	University of California, Los Angeles	BA 1997	560 76%	720 75%	5.0 90%	3.5	Y	N	N
4	Tufts University	BS 1997	580 81%	720 75%	690	3.63	Y	Y	Y
5	India	BS 1997	480 54%	710 73%	4.5 52%	3.88	Y	N	N
6	China University of Iowa	BS 1999 MS 2003	460 48%	800 94%	760	3.67	Y	N	N
7	Texas A&M University University Texas	BS 1998 PharmD 2004				3.75	Y	Y	Y
8	Taiwan	BS 1999 MS 2002	400 30%	770 85%	410	3.9	Y	N	N
9	Taiwan Harvard	BS 2001 MS 2004	420 36%	790 91%	770	3.58	Y	N	N
10	Capital University University of Toledo	BA 2001 MS 2004	630 89%	610 52%	4.5 52%	4.0	Y	N	N
11	India University of Toledo	BS 1998 MS 2004	700 95%	800 94%	640	3.92	Y	N	N
12	India University New Mexico	BS 1995 MS 1999	490 57%	610 52%	520	3.58	Y	N	N
13	Sri Lanka	BS 2003	570 79%	690 74%		3.77	Y	N	N
14	Thailand	BS 1995 MS 1997	280 10%	630 56%	390	3.26	Y	N	N
15	India Florida International University	BS 1998 MHA 2004	550 73%	760 82%	61%	3.98	Y	N	N
16	India University of Delaware	BS 1994 MBA 2003	690 83%	730 78%	600	3.6	Y	N	N

17	Taiwan	BS 2000	470 51%	800 92%	5.5 75%	3.84	Y	N	N
2005									
1	Taiwan	Due to changing from a paper format, to electronic format, for processing, there was an inadvertent loss of data, no information is available.					N	N	N
2	India						Y	N	N
3	China						Y	N	N
4	China						N	N	N
5	Taiwan						N	N	N
6	India						Y	N	N
7	Taiwan						Y	N	N
8	India						Y	N	N
9	Taiwan						N	N	N
10	Taiwan						N	N	N
11	China						Y	N	N
12	Taiwan						Y	N	N
13	University Calgary, Canada	BA 2002 MA 2005				3.53	Y	Y	Y
2006									
1	Korea	BS 2003	620 87%	800 92%	4 32%	3.1	N	N	N
2	Taiwan University of London, UK	BS 1998 MS 2002	350 10%	760 85%	3.5 17%		N	N	N
3	University of Michigan California State University, East Bay	BS 1993 MS 2004	620 87%	550 7%	50	3.76	Y	Y	Y
4	China University Delaware	BA 1993 MPA 2001	710 85%	800 92%	640	3.8	Y	N	N
5	China University of Arizona	BS 1994 MS 2007	620 87%	800 92%	630	3.5	N	N	N
6	University of California, Los Angeles Loma Linda University	BS 1999 PharmD 2006	400 30%	720 75%		3.35	Y	N	N
7	Taiwan	BS 2003 MS 2005	330 15%	750 82%	3.5 17%	4.0	N	N	N
8	Creighton University University of Arizona	BS 1994 PharmD 2004	480 54%	610 56%	4.5 52%	3.47	Y	N	N
9	China	BS 2005 MS 2006	360 21%	730 78%	2.5 2%	3.4	N	N	N
10	China University of Cincinnati	BS 2003 MS 2006	740 98%	790 91%	760	3.7	Y	N	N

11	Taiwan	BS 2003 MS 2005	380 28%	800 92%	30 7%	3.93	N	N	N
12	Kenya University London, UK	BS 2000 MSc 2005	550 73%	790 89%	470	3.8	Y	Y	Y
13	China	BA 2003 MA 2006	510 61%	780 89%	45 52%	3.62	N	N	N
14	China	BS 2006	400 31%	770 87%	40 32%	3.8	N	N	N
15	Uganda Case Western Reserve University	BMS 2001 MS 2006				3.88	Y	Y	Y
2007									
1	Colombia Spain	MD 1999 MSc 2005	530 67%	640 57%		3.76	Y	Y	Y
2	Iran	PharmD 2003				3.2	N	N	N
3	Carroll College, MT University of Washington	BS 1999 PharmD 2003				3.7	Y	Y	Y
4	Washington State University University of Washington	PharmD 1999 MHA 2003	400 31%	510 5%	4.5 52%	3.65	Y	N	N
5	Korea	BS 2002 MS 2004	510 61%	800 92%	3 7%	3.9	N	N	N
6	Argentina China	MD 2001 BS 2007	250 8%	660 63%	3 7%	4.0	N	N	N
7	State University of New York, Buffalo	PharmD 2007	450 45%	720 75%	4.5 52%	3.5	Y	N	N
8	Korea	BS 2004 MS 2006	660 93%	780 89%		3.8	Y	N	N
9	Korea	BS 2002 MS 2004	650 95%	780 89%	2.5 2%	4.0	N	N	N
10	Taiwan Washington State University	BS 2005 MHA 2007	420 36%	780 89%	3.5 17%	3.77	Y	N	N
11	University of Washington University of Southern California	BS 1999 PharmD 2007				3.42	Y	Y	Y
12	Taiwan	BS 2003 MS 2006	710 85%	800 94%	800 92%	3.9	N	N	N
2008									
1	Nigeria	BS 2006	410 33%	620 53%	2.5 2%	3.9	N	N	N
2	University of Washington	PharmD 2009				3.21	Y	Y	Y
3	Taiwan	BS 2003 MS 2005	520 65%	720 75%	3 7%	3.7	Y	N	N

4	Taiwan	BS 1998 MS 2003	330 15%	750 82%	4 31%	3.65	N	N	N
5	Thailand	BS 1995 MS 1999				3.07	N	N	N
6	Wheaton College University of Washington	BS 2003 PharmD 2009				3.58	Y	Y	Y
7	China	MD 2007	700 90%	800 92%	4.5 52%	3.4	N	N	N
8	Korea University of Southern California University of Southern California	BA 1998 MA 2004 MS 2005	610 82%	730 78%	2.5 2%	3.5	Y	N	N
9	Thailand University of South Carolina	BS 2002 MHA 2008	280 10%	650 59%	2.5 2%	2.59	Y	N	N
10	Japan Johns Hopkins University	BS 1991 MPH 2000	330 15%	720 75%	3.5 17%	2.7	Y	Y	Y
11	Korea	BS 2002 MS 2004	600 80%	790 90%	3.5 17%	2.5	Y	N	N
12	Northwestern University Dartmouth University	BS 2006 MS 2008	450 45%	610 52%	4.5 52%	2.9	Y	N	N
13	India University of Houston	BS 2005 MS 2008	570 78%	760 82%	4.0 31%	3.7	Y	N	N
14	Korea	BS 2000 MS 2002	540 70%	800 92%	3.0 7%	3.12	Y	N	N
15	India University of Sciences, Philadelphia	BS 2006 MS 2008	500 59%	740 80%		3.9	Y	N	N
16	Union College University of Washingtonl	BS 2004 MHA 2008	500 59%	720 75%	4.5 52%	3.38	Y	Y	Y
17	Korea	BS 2004 MS 2006	700 95%	800 92%	3.5 16%	2.9	Y	N	N
18	University of Washington	BS 2007	650 92%	670 95%	5.5 80%	3.5	N	N	N
19	University of Iowa Creighton University	BS 1994 MS 1996 PharmD 2000				3.98	Y	Y	Y
20	China	BS 2008	490 57%	800 92%	4.5 52%	3.13	N	N	N
21	China	BM 2008				3.51	N	N	N
22	Taiwan University of Wisconsin, Madison	BS 1998 MS 2003	430 39%	750 81%	35 14%	3.5	N	N	N

23	University of California, Los Angeles University of Southern California	BS 1991 PharmD 1997				3.25	N	N	N
24	University of Washington University of Southern California	BS 2004 PharmD 2008				3.2	Y	Y	Y
25	North Carolina State University Virginia Commonwealth University	BA 1999 PharmD 2008				3.8	Y	N	N
26	University of Washington	BS 2000 PharmD 2008				3.25	Y	N	N
27	Temple University	PharmD 2008	540 71%	560 40%	40 33%	3.88	Y	N	N
28	St. John's University	PharmD 2008				3.49	Y	N	N
2009									
1	University of California, Berkeley University of Southern California	BS 2004 PharmD 2009				3.29	N	N	N
2	University of California, Berkeley University of Southern California	BA 2004 PharmD 2009				3.6	N	N	N
3	University of Washington	BS 2000 PharmD 2008				3.25	Y	N	N
4	Stanford University University of California, San Francisco	BA 2002 PharmD 2009				3.92	Y	N	N
5	University of California, San Diego	BS 2003 MS 2004 PharmD 2009					Y	Y	Y
6	Baylor University	BS 2006	540 71%	790 90%	45 52%	3.69	Y	Y	Y
7	Kuwait University of London, UK	BS 2006 MS 2009	300 7%	600 48%	3.5 8%	3.02	N	N	N
8	Saudi Arabia Hofstra University	BS 2004 MHA 2008	360 22%	600 48%	30 8%	3.84	N	N	N
9	Johns Hopkins University	BS 2005	580 89%	730 71%	40 37%	3.63	Y	Y	Y
10	China	BS 2002 MS 2005	610 87%	790 92%	3.0 8%	3.53	N	N	N
11	Japan Tulane University	BS 2001 MPH 2009	310 8%	700 68%	3 7%	3.9	Y	N	N
12	Thailand	PharmD 2006				3.11	N	N	N
13	Tanzania	BS 1991 MPH 2000	310 7%	600 50%	3 50%	3.2	Y	N	N

Master of Science in Biomedical Regulatory Affairs

Year	Previous Institution	Degree(s) & Year(s)	GRE Scores V Q Adv (Percentiles)	Undergrad GPA	Interviewed (Y/N)	Accepted (Y/N)	Enrolled (Y/N)
2008							
1	Washington State University	BS 1999 PharmD 1999	N/A	3.53	N/A	Y	Y
2	University of Washington	BA 2006	N/A	3.65	N/A	Y	Y
3	National Taiwan University	BS MS 2003	N/A	3.83	N/A	Y	Y
4	University of Virginia	BS 2004	N/A	2.92	N/A	Y	Y
5	University of California, Riverside	BS 1995	N/A	3.12	N/A	Y	Y
6	Seattle Pacific University	BS 1983	N/A	3.20	N/A	Y	Y
7	University of Washington	BS 1998	N/A	3.74	N/A	Y	Y
8	Shanghai Medical University, China	BS 1985 MS 1988	N/A		N/A	Y	Y
9	Fort Wright College	BS 1975	N/A	3.58	N/A	Y	Y
10	Washington State University	BA 1999	N/A	2.65	N/A	Y	Y
11	Cleveland State University	BS 1996	N/A	3.4	N/A	Y	Y
12	University of Delaware	BA 1981	N/A	2.8	N/A	Y	Y
13	University of Kinshasa, Kenya	MD 1990	N/A		N/A	Y	Y
14	Pacific Lutheran University	BS 2001	N/A	2.71	N/A	Y	Y
15	University of Siegen	MA 1980	N/A		N/A	Y	Y
16	University of Washington	BA 2003	N/A	3.59	N/A	Y	Y
17	Bemidji State University	BS 1989	N/A	3.0	N/A	Y	Y
18	University of Washington	BA/BA 2003	N/A	2.84	N/A	Y	Y
19	Universite Pierre et Marie Curie, Saint-Antoine, France	MD 1993	N/A		N/A	Y	Y
20	University of Washington Rockefeller University	BS 1998 MS 2002	N/A	3.47	N/A	Y	Y
21	Shanghai First Medical College, China University of Washington	BS 1975 MS 2008	N/A		N/A	Y	Y
22	University of Washington	BS 2002	N/A	2.18	N/A	Y	Y
23	University of Washington	PharmD 2001	N/A		N/A	Y	Y
24	University of Washington	BS 2004	N/A	3.18	N/A	Y	Y

25	University of Tennessee, Old Dominion University of Washington	BA 1996 BS 2007 MS 2006	N/A	3.44	N/A	Y	Y
26	Second Medical Military University, China	MD 1985 MS 1988	N/A		N.A	Y	Y
27	Osmania University, India State University of New York, Stony Brook	BS 1990 PhD 1998	N/A	4.0	N/A	Y	N
28	A.R. College of India	B Pharm 2004 MS 2005	N/A	3.8	N/A	Y	N
29	University of Southern California	BS 2007	N/A	2.7	N/A	Y	N
30	University of Rajasthan, India	BS 1986 MS 1988 PhD 1995	N/A	3.75	N/A	N	N
31	Pennsylvania State University	BS 2007	N/A	3.56	N/A	N	N
2009							
1	University of Washington Seattle University	BA 1996 JD 2001	N/A	3.51	N/A	Y	Y
2	Carnegie-Mellon University	BS	N/A	3.55	N/A	Y	Y
3	Washington State University University of Washington	BA 1976 BN 1979 MHA 2004	N/A	3.85	N/A	Y	Y
4	Vitebsk State Medical University, Belarus	MD 1997	N/A	3.0	N/A	Y	Y
5	University of Washington	BA 2008	N/A	3.42	N/A	Y	Y
6	Saronjini Naidu Government Girls' Post Graduate College, India, Devi Ahilya Vishwavidyalaya, India	BS 2005 MS 2004	N/A	3.7	N/A	Y	Y
7	McGill University, Canada	BS 1994	N/A	2.97	N/A	Y	Y
8	University of Waterloo, Canada	BS 2008	N/A	3.22	N/A	Y	Y
9	Scripps College	BA 2004	N/A	3.6	N/A	Y	Y
10	University of Colorado, Boulder	BA 1994	N/A	2.55	N/A	Y	Y
11	Kyoto Pharmaceutical University, Japan	BPharm1995	N/A	3.4	N/A	Y	Y
12	Union College	BS 1995	N/A	3.8	N/A	Y	Y
13	Rochester Institute of Technology University of Rochester	BS 1987 PhD 1993	N/A	3.4	N/A	Y	Y
14	Kenyatta University, Kenya	BS 2005	N/A	3.4	N/A	Y	Y
15	California Polytechnic State University	BS 2004	N/A	2.7	N/A	Y	Y
16	Kenya Medical Training College	No recognized degree	N/A	2.3	N/A	Y	Y
17	University of Arizona	BS 2003 MS 2004	N/A	3.77	N/A	Y	Y
18	University of Washington	BA 2006	N/A	3.05	N/A	Y	Y
19	Wright State University	BS 1994	N/A	3.2	N/A	Y	Y

20	Bharati Vidyapeeth Medical College, India	Bachelor of Medicine and Surgery 2004	N/A	3.2	N/A	Y	Y
21	Seattle Pacific University	BA 2002	N/A	3.25	N/A	Y	Y
22	Evergreen State College	BA 2006	N/A	4.0	N/A	Y	Y
23	University of Ouagadougou, Burkina Faso, St. Cloud State University	BS 1990 MS 2007	N/A	3.18	N/A	Y	Y
24	Willamette University	BA 2009	N/A	3.25	N/A	Y	N
25	Dalhousie University, Queen's University, Canada	BS 2001 Master of Theological Studies 2005	N/A	3.15	N/A	Y	N
26	City University	BA 2005	N/A	3.8	N/A	Y	N
27	Amity Institute of Biotechnology, India	BS 2005	N/A	3.0	N/A	Y	N
28	University of Washington	BA 2007	N/A	2.13	N/A	N	N
29	University of Washington	BS 2007	N/A	2.44	N/A	N	N
30	University of California, Santa Barbara	BS 2008	N/A	2.54	N/A	N	N
31	Tung Hai University, Taiwan	BS 2003	N/A	2.71	N/A		
32	Ihna University The Catholic University of Korea, Korea	BS 2001 MS 2003	N/A	3.88	N/A		
33	Washington State University	BS 2004	N/A	3.87	N/A		
34	Yale University	BS 1994	N/A	3.8	N/A		

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SCHOOL OF PHARMACY

UNIVERSITY *of* WASHINGTON

Graduate Program Review and Self-Study

Table 10

Core Didactic Courses

November 2009

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Table 10. Core Didactic Courses

Medicinal Chemistry (PhD Program Requirements)	
MEDCH 501 **Advanced Medicinal Chemistry** (4 credits)	Advanced study of the various classes of medicinal compounds, with particular emphasis on biological activity, mechanism of action, biotransformation, and the structural and physical properties governing absorption, distribution, and excretion.
MEDCH 502 **Advanced Medicinal Chemistry** (4 credits)	Advanced study of the various classes of medicinal compounds, with particular emphasis on biological activity, mechanism of action, biotransformation, and the structural and physical properties governing absorption, distribution, and excretion.
MEDCH 503 **Advanced Medicinal Chemistry** (4 credits)	Advanced study of the various classes of medicinal compounds, with particular emphasis on biological activity, mechanism of action, biotransformation, and the structural and physical properties governing absorption, distribution, and excretion.
MEDCH 520 **Seminar** (1 credit)	Graduate students attend seminars and make one formal presentation per year while in residence; maximum of three presentations. Offered: jointly with PCEUT 520.
MEDCH 527 **Drug Metabolism** (4 credits)	Considerations of the biochemical mechanisms for the biotransformation of drugs and foreign compounds. Includes reaction mechanisms, ultrastructural considerations, induction mechanisms, methodology, kinetics of inhibition and activation, steroid and amine metabolism.
MEDCH 530 **Mass Spectrometry of Drugs, Toxicants, and Metabolites** (3 credits)	Current approaches to the combination of liquid chromatography with mass spectrometry for small molecules. Mass spectrometry of drugs, toxicants, metabolites. Emphasis on interpretation skills, with problem sets each week. Introduction to LC/MS instrumentation. Ionization methods appropriate for small molecules. Capillary LC/MS and capillary electrophoresis.
MEDCH 541 **Mass Spectrometry Based Proteomics** (3 credits)	Covers basics of sample preparation, data generation, instrumentation, ionization, and data interpretation of peptide tandem mass spectra manually. Uses database search engines and bioinformatics in systems biology related proteomics.
CHEM 530 **Advanced Organic Chemistry** (3 credits)	Fundamental aspects of organic structures and transformations. Structure and basicity of carbanions, substitution reactions, elimination reactions, nucleophilic addition and addition/elimination reactions, condensation reactions, structure and rearrangements of carbocations, electrophilic addition, electrophilic substitutions, neighboring group effects.
CHEM 531 **Advanced Organic Chemistry** (3 credits)	Synthetic organic chemistry. Discussion of practical methods for the synthesis of complex organic molecules with an emphasis on strategy and the control of stereochemistry.
CHEM 532 **Advanced Organic Chemistry** (3 credits)	Chemical Biology. Application of chemical methods to the study of biological processes that occur in cells.
BIOC 530 **Introduction to Structural Biology** (3 credits)	Graduate-level discussion of the structure, function, and chemistry of proteins, control of enzymatic reactions.

Pharmaceutics (MS Program Requirements)

PCEUT 506 **Pharmacokinetic Principles** (6 credits)	Covers the fundamentals of pharmacokinetics. Includes lectures and laboratory exercises on the key concepts in pharmacokinetics, including compartmental kinetics, clearance, protein binding, bioavailability, pharmacodynamics, clinical pharmacokinetics, and Michaelis-Menten kinetics.
PCEUT 501 * **Advanced Pharmacokinetics I** (5 credits)	Advanced study of the kinetics of drug absorption, distribution, excretion, metabolism, and effects in mammalian systems. Compartmental model and model-independent approaches examined. Drug disposition studied in a physiologically realistic context taking nonlinear events into account. Aimed at development of innovative methods for data analysis and evaluation in biological systems.
PCEUT 502 * **Pharmacokinetics of Drug Metabolism** (4 credits)	Advanced study of drug metabolism pharmacokinetics. Topics emphasize linear and nonlinear metabolic clearance kinetics, metabolite kinetics, in vitro-in vivo predictions, drug-drug interaction kinetics and pharmacogenetics.
PCEUT 503 * **Drug Transport and Delivery** (5 credits)	Provides advanced knowledge of the physico-chemical and biological concepts underlying the transport and delivery of drugs. Emphasizes the cell uptake and efflux functions as well as the interplay between transport and intracellular biotransformation and drug effect.
PHCOL 510 ** **Drug Discovery and Emerging Therapeutics** (2 credits)	Consideration of the general principles and current approaches involved in modern drug discovery and development, with an emphasis on basic concepts in drug action, delivery, and metabolism. Discussion of novel drug discovery techniques and emerging non-standard therapeutics.
PHCOL 512 ** **Autonomic/Cardiovascular Pharmacology** (2.5 credits)	Consideration of the pharmacology of the cardiovascular and autonomic nervous systems. Emphasizes the mechanisms of neurotransmitter, hormone, drug action at autonomic synapses, and the molecular basis for physiology and pathophysiology of the cardiovascular system. Lectures, group discussion, and analysis of recent research. Prerequisite: organic chemistry, biochemistry, introductory anatomy, and physiology.
PHCOL 512 ** **Neuropharmacology** (2 credits)	Consideration of the neurobiological basis of drug action on the central nervous system, including mechanism of action and therapeutic use in psychiatric disorders; nerodegeneration/neuroinflammation; control of neuronal excitability and pain; and drug abuse and addition. Lecture, group discussion, and analysis of recent research. Recommended: organic chemistry, biochemistry, introductory anatomy, and physiology.
PHCOL 513 ** **Endocrine Pharmacology and Chemotherapeutics** (2 credits)	Consideration of the pharmacology of endocrine systems including the hypothalamic/pituitary regulatory peptides, glycoprotein hormones/growth factors, peptide and steroid hormones. Basic principles of chemotherapy of endocrine and other cancers, as well as viral and microbial diseases. Lecture, group discussion, and analysis of recent research.
BIOST 511 **Medical Biometry I** (4 credits)	Presentation of the principles and methods of data description and elementary parametric and nonparametric statistical analysis. Examples are drawn from the biomedical literature, and real data sets are analyzed by the students after a brief introduction to the use of standard statistical computer packages. Statistical techniques covered include description of samples, comparison of two sample means and proportions, simple linear regression and correlation.
PCEUT 520 **Topics in Pharmaceutics** (1 credit)	Discussion of pertinent articles from current literature and recent laboratory results. Offered: jointly with MEDCH 520.
PCEUT 583 **Seminar** (1 credit)	Graduate students attend seminars and make one formal presentation per year while in residence; maximum of three presentations.

* Students choose 1 of 3 advanced PCEUT courses

** Students choose 3 of 4 graduate-level PHCOL courses

Pharmaceutics (PhD Program Requirements)

PCEUT 506 **Pharmacokinetic Principles** (6 credits)	Covers the fundamentals of pharmacokinetics. Includes lectures and laboratory exercises on the key concepts in pharmacokinetics, including compartmental kinetics, clearance, protein binding, bioavailability, pharmacodynamics, clinical pharmacokinetics, and Michaelis-Menten kinetics.
PCEUT 501 **Advanced Pharmacokinetics I** (5 credits)	Advanced study of the kinetics of drug absorption, distribution, excretion, metabolism, and effects in mammalian systems. Compartmental model and model-independent approaches examined. Drug disposition studied in a physiologically realistic context taking nonlinear events into account. Aimed at development of innovative methods for data analysis and evaluation in biological systems.
PCEUT 502 **Pharmacokinetics of Drug Metabolism** (4 credits)	Advanced study of drug metabolism pharmacokinetics. Topics emphasize linear and nonlinear metabolic clearance kinetics, metabolite kinetics, in vitro-in vivo predictions, drug-drug interaction kinetics and pharmacogenetics.
PCEUT 503 **Drug Transport and Delivery** (5 credits)	Provides advanced knowledge of the physico-chemical and biological concepts underlying the transport and delivery of drugs. Emphasizes the cell uptake and efflux functions as well as the interplay between transport and intracellular biotransformation and drug effect.
PHCOL 510 * **Drug Discovery and Emerging Therapeutics** (2 credits)	Consideration of the general principles and current approaches involved in modern drug discovery and development, with an emphasis on basic concepts in drug action, delivery, and metabolism. Discussion of novel drug discovery techniques and emerging non-standard therapeutics.
PHCOL 512 * **Autonomic/Cardiovascular Pharmacology** (2.5 credits)	Consideration of the pharmacology of the cardiovascular and autonomic nervous systems. Emphasizes the mechanisms of neurotransmitter, hormone, drug action at autonomic synapses, and the molecular basis for physiology and pathophysiology of the cardiovascular system. Lectures, group discussion, and analysis of recent research. Prerequisite: organic chemistry, biochemistry, introductory anatomy, and physiology.
PHCOL 512 * **Neuropharmacology** (2 credits)	Consideration of the neurobiological basis of drug action on the central nervous system, including mechanism of action and therapeutic use in psychiatric disorders; nerodegeneration/neuroinflammation; control of neuronal excitability and pain; and drug abuse and addition. Lecture, group discussion, and analysis of recent research. Recommended: organic chemistry, biochemistry, introductory anatomy, and physiology.
PHCOL 513 * **Endocrine Pharmacology and Chemotherapeutics** (2 credits)	Consideration of the pharmacology of endocrine systems including the hypothalamic/pituitary regulatory peptides, glycoprotein hormones/growth factors, peptide and steroid hormones. Basic principles of chemotherapy of endocrine and other cancers, as well as viral and microbial diseases. Lecture, group discussion, and analysis of recent research.
BIOST 511 **Medical Biometry I** (4 credits)	Presentation of the principles and methods of data description and elementary parametric and nonparametric statistical analysis. Examples are drawn from the biomedical literature, and real data sets are analyzed by the students after a brief introduction to the use of standard statistical computer packages. Statistical techniques covered include description of samples, comparison of two sample means and proportions, simple linear regression and correlation.
BIOST 512 **Medical Biometry II** (4 credits)	Multiple regression, analysis of covariance, and an introduction to one-way and two-way analyses of variance: including assumptions, transformations, outlier detection, dummy variables, and variable selection procedures.
TC 509 (HCDE 509) **Writing the Scientific Article** (3 credits)	Examination of principles and practice of writing research manuscripts, articles, abstracts, and oral presentations. Detailed examination of scientific publication process includes issues of style, organization, and ethics. Students draft, critique, and revise their own manuscripts and learn to review the manuscripts of others.
PCEUT 520 **Topics in Pharmaceutics** (1 credit)	Discussion of pertinent articles from current literature and recent laboratory results. Offered: jointly with MEDCH 520.
PCEUT 583 **Seminar** (1 credit)	Graduate students attend seminars and make one formal presentation per year while in residence; maximum of three presentations.

* Students choose 3 of 4 graduate-level PHCOL courses

Pharmacy - Pharmaceutical Outcomes Research and Policy Program (PhD Program Requirements)

BIOST 511 **Medical Biometry I** (4 credits)	Presentation of the principles and methods of data description and elementary parametric and nonparametric statistical analysis. Examples are drawn from the biomedical literature, and real data sets are analyzed by the students after a brief introduction to the use of standard statistical computer packages. Statistical techniques covered include description of samples, comparison of two sample means and proportions, simple linear regression and correlation.
BIOST 512 **Medical Biometry II** (4 credits)	Multiple regression, analysis of covariance, and an introduction to one-way and two-way analyses of variance: including assumptions, transformations, outlier detection, dummy variables, and variable selection procedures. Examples drawn from the biomedical literature with computer assignments using standard statistical computer packages.
BIOST 513 **Medical Biometry III** (4 credits)	Analysis of categorical data including two sample methods, sets of 2 x 2 tables, R x C tables, and logistic regression. Classification and discrimination techniques. Survival analysis including product limit estimates and the Cox proportional hazards model.
EPI 512 **Epidemiologic Methods I** (4 credits)	Principles and methods of epidemiology. Covers measures of disease frequency, measures of effect, causal inferences, descriptive epidemiology, study types, misclassification, and effect modification. Designed for students who want to take 513. Prerequisite: prior or concurrent enrollment in BIOST 511 or equivalent.
EPI 513 **Epidemiologic Methods II** (4 credits)	Continuation of 512. Considers how designs of epidemiologic studies may be constructed to maximize etiologic inferences. Covers confounding, randomized trials, cohort studies, case-control studies, and selected topics.
PB AF 516 **Microeconomic Policy Analysis** (3 credits)	Ways in which microeconomic analysis can contribute to the analysis of public sector issues. Supply and demand, consumer and firm behavior, competitive and monopoly markets, income distribution, market failure, government intervention. Policy applications of theory.
PHARM 532 **Methods in Pharmaceutical Policy Analysis** (4 credits)	Introduction to the tools used in and the framework and dominant contexts for pharmaceuticals policy development and analysis. Methods reviewed in a series of sessions presenting a specific method and case analyses involving pharmaceuticals development.
PHARM 533 **Pharmacoepidemiology** (3 credits)	Overview of pharmacoepidemiology including drug development and approval; application of epidemiologic methods to study drug safety and effectiveness; exploration of the interplay between research and public policy; introduction to resources for information about drugs; introduction to pharmacology principles pertinent to pharmacoepidemiology.
PHARM 534 **Economic Evaluation in Health & Medicine** (3 credits)	Methods and techniques for evaluating costs and cost-effectiveness of health, medical, and pharmaceutical interventions. Emphasis on economic evaluation, decision analysis, and modeling techniques for resource allocation and decision making. Applications to technology assessment, health policy, clinical practice, and resource allocation.
PHARM 535 **Assessing Outcomes in Health & Medicine** (3 credits)	Concepts and methods for developing and using patient-reported outcomes in health and medicine. Emphasis on patient self-reported health status and quality of life. Qualitative research and psychometric methods applied to health outcomes assessment and all applications.
PHARM 597 **Graduate Seminar** (1 credits)	Interactive discussion of topical issues, methods, or analytic techniques.

Pharmacy - Biomedical Regulatory Affairs (MS Degree Requirements)

PHARM 516 **Introduction to Biomedical Regulatory Affairs** (3 credits)	Surveys government oversight of drugs, devices, and biotechnology derived products; laws and regulations that apply to development, testing, and production; and responsibilities of a regulatory affairs specialist in the regulatory setting.
PHARM 517 **Product Development and Manufacturing Systems** (3 credits)	Surveys government oversight of drugs, devices, and biotechnology derived products; laws and regulations that apply to development, testing, and production.
PHARM 518 **Product Testing, Evaluation and Post-Market Issues** (3 credits)	Medical product post-marketing requirements; reporting and enforcement actions; inspections (internal and by regulators) preparation, conduct and follow-up actions; surveillance and studies, reimbursement, and economics.
PHRMRA 524 **Introduction to Clinical Trials** (3 credits)	Introduces the major concepts under which clinical trials are designed to run. Focuses on the phases of clinical trials, the role of the Food and Drug Administration, Institutional Review Boards, the Code of Federal Regulations and ethical principles. Addresses study design and statistical concepts.
PHRMRA 525 **Implementation and Conduct of Clinical Trials** (3 credits)	Outlines the work of carrying out a clinical trial including, the complex work of study initiation, the issues of site and data managements, the preparation of the final report and study close out, as well as the details that control the study conduct.
PHRMRA 526 **Project Management and the Business of Clinical Trials** (3 credits)	Address the business dimension of clinical trials. Addressed the principles of project management, planning, analysis, contingency and follow-up within the context of clinical trials that involve a large number of tasks and people responsible for parts of the overall study.
PHRMRA 527 **International Regulatory Affairs** (3 credits)	Develops an understanding of international differences in the regulation of design, manufacture and post-marketing surveillance of medical products relative to US Food and Drug Administration Requirements.
PHRMRA 528 **Medical Risk Analysis and Management** (3 credits)	Examines the principles and application of risk management methods in the design, manufacturing and marketing of medical products.
PHRMRA 545 **Statistical Basis of Quality Assurance for Regulated Industries** (3 credits)	Applies statistical methods to medical products design, clinical evaluation, manufacturing and post-marketing surveillance. Prerequisite: introductory statistics.
PHRMRA 546 **Technical Writing for the Medical Products Industries** (3 credits)	Presents up-to-date information and strategies for effective technical communication within the medical product industries. Addresses the appropriate and correct use of the English language, information design, and the use of computer technology in producing professional documents. Emphasizes communicating technical information to a variety of stakeholders
PHRMRA 547 **Advanced Topics in Medical Products Regulation** (2 credits)	Addresses essential topics in medical products regulation. Employs a combination of lecture presentations, case studies, and participants' small group discussion to achieve practical outcomes for regulatory professionals.
PHRMRA 548 **Practicum** (1–9 credits)	Provides a practical experience to ensure that participants are able to shepherd new medical products (drug, device, biologic) through regulator, clinical and quality assurance aspects. Includes a project and final report.

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SCHOOL OF PHARMACY

UNIVERSITY *of* WASHINGTON

Graduate Program Review and Self-Study

Table 11

Competitive Awards Received by Students During the Last Five Years

November 2009

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Table 11. Competitive Awards Received by Students During the Last Five Years (2004–2009)

Medicinal Chemistry

2004

Carrie Mosher:
- Poster award recipient at the7th International Meeting of the International Society for the Study of Xenobiotics (ISSX), Vancouver, Canada
- Achievement Award for College Scientists (ARCS) for 2001-2004.

2005

Kelsey Hanson:
- Achievement Award for College Scientists (ARCS) for 2005-2008.

Han Kiat Ho:
- Carl Smith Award for the best poster presentation at the Mechanism's Specialty Section at the Society of Toxicology (SOT) annual meeting.

Bo Wen:
- Second Place Best Graduate Student Poster Presentation Award from the International Society for the Study of Xenobiotics (ISSX) at the joint ISSX/JSSX, Hawaii.

2006

Elva Gao:
- First place predoctoral poster award at the 14th North American Regional Meeting of International Society for the Study of Xenobiotics (ISSX), Rio Grande, Puerto Rico

Carrie Mosher:
- Third place predoctoral poster award at the 14th North American Regional Meeting of International Society for the Study of Xenobiotics (ISSX), Rio Grande, Puerto Rico

Caleb Woods:
- Achievement Award for College Scientists (ARCS) for 2006-2009.

2007

No awards noted

2008

Kelsey Hanson:
- Travel award to attend the15th North American Regional Meeting of the International Society for the Study of Xenobiotics (ISSX), San Diego, CA

2009

Mariko Nakano:

- Travel award to attend the 16th Annual International Conference on Cytochrome P450, Okinawa, Japan

Brendan Stamper:

- Carl C. Smith award for best poster at the Society of Toxicology Conference, Baltimore, MD

Caleb Woods:

- American Chemical Society Division of Medicinal Chemistry Predoctoral Fellowship

Pharmaceutics

2004

Caiping Yao:
- Paper selected as co-winner in the Drug Metabolism category of the James R. Gillette Drug Metabolism Best Papers of 2003 (ASPET).
- Invited presentation at the Experimental Biology Meeting in Washington D.C.

2005

Kirby, Brian:
- Achievement Award for College Scientists (ARCS) for 2005-2008.

Peng Hsiao:
- Travel award and podium presentation, AAPS Workshop on "Drug Transporters in ADME: from the bench to the bedside", Parsippany NJ

Aaron Ren:
- Awarded Elmer M. Plein Endowed Research Fund for the proposal: "The Effect of ST1571 (Gleevec) on Fludarabine Disposition and Cytotoxicity."

2006

Weili Huang:
- AAPS Graduate Student Symposium Award in Pharmacokinetics, Pharmacodynamics, Drug Metabolism and Clinical Sciences, Nashville, TN

Ian Templeton:
- Finalist for poster award at the 14th North American Regional Meeting of International Society for the Study of Xenobiotics (ISSX), Rio Grande, Puerto Rico

Huixia Zhang
- Finalist for poster award at the 14th North American Regional Meeting of International Society for the Study of Xenobiotics (ISSX), Rio Grande, Puerto Rico

Alysa Walker:
- Gordon Conference registration

2007

John Hoekman:
- University of Washington Technology Gap Innovation Award

Peng Hsiao:
- Travel award to 4th World Conference on "Drug Absorption, Transport and Delivery", Kanazawa, Japan

Chris Endres:
- Appointed to the PPDM Executive Committee of the AAPS

2008

John Hoekman:
- Grand Prize, University of Washington Business Plan Competition
- Best Innovation Prize, University of Washington Business Plan Competition
- Seattle Business Magazine Top 25 Innovator in Pacific Northwest

2009

Aaron Moss:
- Travel award from PPDM section to AAPS, Los Angeles, CA

Jayne Thatcher:
- Educational Research Award from the Society of Forensic Toxicologists

Li Liu:
- Travel award from Center For AIDS Research Training Support Grant to 16th North American Regional Meeting of the International Society for the Study of Xenobiotics (ISSX), Baltimore, MD

Peng Hsiao:
- CFAR (Center For AIDS Research, University of Washington) Trainee Support Grants
- Travel award and podium presentation, AAPS Workshop on “Drug Transporters in ADME: from the bench to the bedside”, Baltimore, MD

Alysa Walker:
- Gordon Conference registration

Pharmaceutical Outcomes Research and Policy Program

2004

Lisa Meckley:
- Achievement Award for College Scientists (ARCS) for 2002-2005
- Best Student Podium Presentation: 9th Annual International Meeting, International Society for Pharmacoeconomics and Outcomes Research

Scott Strassels:
- excelleRx Foundation Fellowship

2005

Sarika Ogale:
- Magnuson Scholar Award 2005-2006

Thy Do:
- Predoctoral fellowship from the PhRMA Foundation

2006

Lisa Meckley:
- Predoctoral fellowship from the PhRMA Foundation

Elizabeth James:
- Travel award to the AACP Teachers Seminar (2006 Wal-Mart Annual Conference $1,000 travel scholarship), San Diego, CA

2007

Eldon Spackman:
- Magnuson Scholar Award

Jonathan Campbell:
- Honorable Mention for Poster Presentation at the 2007 International Meeting of the International Society for Pharmacoeconomics and Outcomes Research

Elizabeth James:
- Pre-Doctoral Fellowship in the Pharmaceutical Sciences from the PhRMA Foundation

Lisa Meckley:
- Best Graduate Student Poster Award at the 2007 International Society for Pharmaceutical Outcomes Research (ISPOR) meeting.

2008

Elizabeth James:
- American Foundation for Pharmaceutical Education (AFPE) Predoctoral Fellowship

Joseph Babigumira:
- William and Flora Hewlett Foundation and the Institute of International Education (IIE) Award

Heidi Wirtz:
- Achievement Award for College Scientists (ARCS) for 2008-2011

2009

Eldon Spackman:

- American Foundation for Pharmaceutical Education (AFPE) Predoctoral Fellowship

Master of Science in Biomedical Regulatory Affairs

Not Applicable

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SCHOOL OF PHARMACY

UNIVERSITY *of* WASHINGTON

Graduate Program Review and Self-Study

Appendix A

Organizational Chart

November 2009

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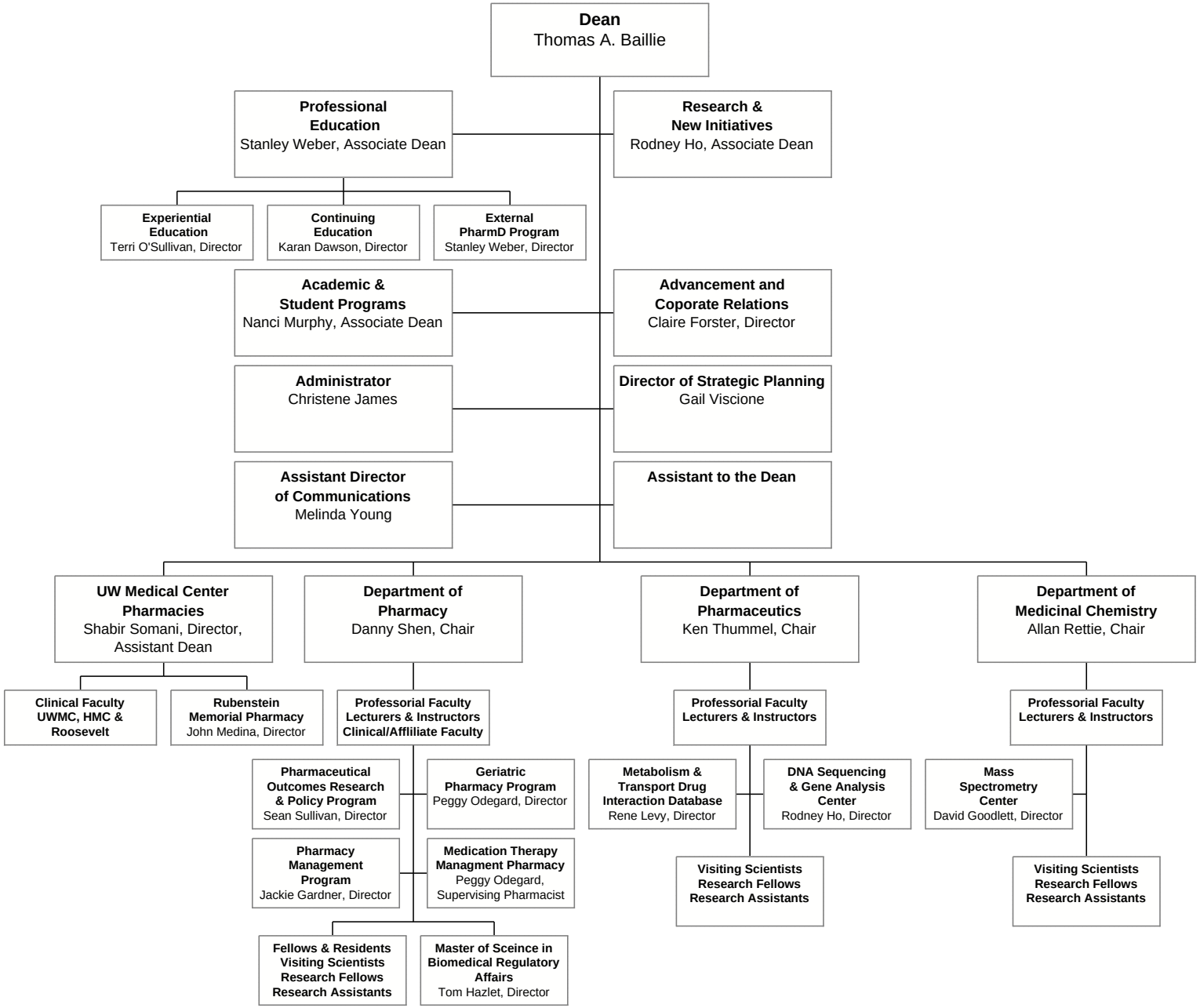
University of Washington

School of Pharmacy



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SCHOOL OF PHARMACY

UNIVERSITY *of* WASHINGTON

Graduate Program Review and Self-Study

Appendix B

Budget Summary

November 2009

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Summary of Income Budget for School of Pharmacy

2003–2004		2005–2006		2007–2008	
Sales and Services	$4,430,661	Sales and Services	$4,970,958	Sales and Services	$5,106,211
Professional Fees	$70,000	Professional Fees	$73,817	Professional Fees	$77,003
Endowment return	$381,053	Endowment return	$438,096	Endowment return	$542,579
Gifts	$1232,612	Gifts	$1,650,696	Gifts	$1,916,840
Overhead Return	$767,033	Overhead Return	$1,011,209	Overhead Return	$920,975
State Budget	$4,337,886	State Budget	$5,197,127	State Budget	$5,649,454
Grants, Contracts	$13,040,226	Grants, Contracts	$12,284,010	Grants, Contracts	$8,399,533
Other	$630,342	Other	$684,773	Other	$757,539
Total:	**$24,889,813**	**Total:**	**$26,310,686**	**Total:**	**$23,370,134**
2004–2005		**2006–2007**		**2008–2009**	
Sales and Services	$4,908,158	Sales and Services	$4,898,233	Sales and Services	$5,001,411
Professional Fees	$70,000	Professional Fees	$78,930	Professional Fees	$134,853
Endowment return	$383,333	Endowment return	$483,664	Endowment return	$366,871
Gifts	$2,155,261	Gifts	$1,707,705	Gifts	$1,810,840
Overhead Return	$915,520	Overhead Return	$1,044,494	Overhead Return	$947,139
State Budget	$4,790,618	State Budget	$5,513,133	State Budget	$5,690,178
Grants, Contracts	$15,070,029	Grants, Contracts	$13,175,785	Grants, Contracts	$9,524,597
Other	$665,710	Other	$760,105	Other	$750,540
Total:	**$28,958,629**	**Total:**	**$27,662,049**	**Total:**	**$24,226,429**

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SCHOOL OF PHARMACY

UNIVERSITY *of* WASHINGTON

Graduate Program Review and Self-Study

Appendix C

Information about the Faculty

November 2009

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Appendix C. Participating Faculty Members in Graduate Programs

Medicinal Chemistry

Name/Degree(s)	Rank	Primary (& Secondary) Appointment(s)	Graduate Program (% effort)	Research Interest
Atkins, William M., PhD	Professor	Medicinal Chemistry	Medicinal Chemistry (35%) PharmD (10%)	Structure-function mechanism of glutathione S-transferases and cytochrome P450; protein engineering of supramolecular aggregates
Baillie, Thomas A., PhD, DSc	Professor, Dean	Medicinal Chemistry	Medicinal Chemistry (5%)* PharmD (5%)	Chemical mechanisms of drug metabolism and toxicity
Catalano, Carlos E., PhD	Professor	Medicinal Chemistry	Medicinal Chemistry (25%) PharmD (20%)	Mechanistic Studies on Virus Assembly ~ Kinetic, biochemical, biophysical and structural characterization of DNA packaging motors
Daggett, Valerie, PhD	Professor	Bioengineering (9/07)**	0% in 2008-2009	Protein dynamics of Alzheimer's and prion proteins
Elmer, Gary, PhD	Professor Emeritus	Medicinal Chemistry	Medicinal Chemistry (15%) PharmD (15%)	Identification and determination of the significance of drug interactions with popular botanical (herbal) products
Goodlett, David R., PhD	Professor	Medicinal Chemistry	Medicinal Chemistry (40%) PharmD (5%)	Mass spectrometric and in silico methods for protein structure-function prediction
Kunze, Kent L., PhD	Associate Professor	Medicinal Chemistry	Medicinal Chemistry (30%) PharmD (20%)	Cytochrome P450 catalyzed drug metabolism, enzyme kinetics and mechanisms; prediction of drug-drug interactions
Lee, Kelly, PhD	Assistant Professor	Medicinal Chemistry (Microbiology)	Medicinal Chemistry (30%) PharmD (10%)	Biophysical studies of conformational dynamics in viruses. Influenza Hemagglutinin: structure, dynamics and cooperativity during fusion
Nelson, Sidney D., PhD	Professor, Dean Emeritus	Medicinal Chemistry	Medicinal Chemistry (25%) PharmD (35%)	Elucidation of drug biotransformation pathways that lead to highly reactive, often toxic metabolites, and the transcriptomic and proteomic perturbations these metabolites cause; synthesis of new drug entities; cytochrome P450 structure-function relationships
Nelson, Wendel L., PhD	Professor	Medicinal Chemistry	Medicinal Chemistry (20%) PharmD (60%)	Conformational, configurational and mechanistic aspects of drug action and drug metabolism; stereo- and enantioselectivity of oxidative metabolic processes; selective ligands for opioid receptor subclasses
Rettie, Allan E. PhD	Professor, Chair	Medicinal Chemistry	Medicinal Chemistry (30%) PharmD (10%)	Drug metabolism: Structure-function relationships and pharmacogenetics of P450
Totah, Rheem A., PhD	Assistant Professor	Medicinal Chemistry	Medicinal Chemistry (30%) PharmD (25%)	Extrahepatic cytochrome P450 enzymes involved in drug-induced tissue-specific toxicity

*Estimate for the Dean of the School of Pharmacy, Thomas A. Baillie, based on his participation in MEDCH 582 and MEDCH 520.

**Transferred to Bioengineering 9/07

Pharmaceutics

Name/Degree(s)	Rank	Primary (& Secondary) Appointment(s)	Graduate Program (% effort)	Research Interest
Bloedow, Duane, PhD	Senior Lecturer	Pharmaceutics	Pharmaceutics (35%) PharmD (20%)	Integration of research in discovery, preclinical, and clinical pharmacology for lead small molecule selection for drug development
Ho, Rodney J.Y., PhD	Professor	Pharmaceutics (Fred Hutchinson Cancer Research Center, Washington National Primate Research Center)	Pharmaceutics (43%) PharmD (10%)	Enhancement of anti-cancer and anti-infective therapy through targeted drug delivery to lymphoidal tissue; targeted drug delivery to the brain and mechanisms of drug resistance
Hu, Shiu-Lok, PhD	Professor	Pharmaceutics (Microbiology, Washington National Primate Research Center)	Pharmaceutics (11.5%) PharmD (2.5%)	Mechanisms of host-viral pathogen interactions and the development of effective HIV-1 vaccines; animal models for HIV/AIDS research
Isoherranen, Nina, PhD	Assistant Professor	Pharmaceutics	Pharmaceutics (66%) PharmD (10%)	Regulation of all-trans-retinoic acid homeostasis and involvement of CYP26 activity; mechanisms of xenobiotic-induced teratogenicity; metabolically-based drug-drug interactions
Kelly, Edward, PhD	Research Assistant Professor	Pharmaceutics	Pharmaceutics (15%) PharmD (5%)	Function of CYP4 enzymes in drug/xenobiotic metabolism and role in disease; stem cell-derived hepatocytes as a model for studying drug/xenobiotic metabolism
Lin, Yvonne S., PhD	Acting Assistant Professor	Pharmaceutics	Pharmaceutics (35%) PharmD (2%)	Regulation of drug metabolizing enzymes in children; effect of obesity and diabetes; metabolomics in the identification of endogenous biomarkers of ADME
Mao, Qingcheng, PhD	Associate Professor	Pharmaceutics	Pharmaceutics (57%) PharmD (15%)	Drug disposition mediated by BCRP; maternal-fetal drug transport in the placenta and into breast milk; regulation of drug transporters
Shen, Danny D., PhD	Professor	Pharmacy (Pharmaceutics, Fred Hutchinson Cancer Research Center)	Pharmaceutics (10%) PharmD (6%)	Adverse drug interactions between opioid analgesics and herbal supplements; mechanisms of CYP enzyme induction and inhibition by natural products and relationship with cancer risk
Thummel, Kenneth E., PhD	Professor, Chair	Pharmaceutics (Environmental and Occupational Health Sciences, Institute for Public Health Genetics)	Pharmaceutics (38%) PharmD (10%)	Mechanisms of inter-individual variability in drug clearance; role of DMEs in adverse drug responses; pharmacogenetics – molecular mechanisms, clinical translation and public policy
Unadkat,Jashvant D., PhD	Professor	Pharmaceutics (Anesthesiology, Center for Human Development and Disability, Washington National Primate Research Center, Center for AIDS and STD)	Pharmaceutics (52%) PharmD (10%)	Mechanisms of transport and metabolism of drugs to treat HIV, AIDS associated infections and cancer; drug disposition, DDIs and adverse drug response; cell efflux transporters and disease risk
Wang, Joanne, PhD	Associate Professor	Pharmaceutics (Fred Hutchinson Cancer Research Center)	Pharmaceutics (41%) PharmD (5%)	Novel drug and neurotransmitter transporters in the CNS, and association with drug efficacy and disease risk; impact of drug transport on oral bioavailability and renal clearance processes

Pharmaceutical Outcomes Research and Policy Program

Name/Degree(s)	Rank	Primary (& Secondary) Appointment(s)	Graduate Program (% effort)	Research Interest
Blough, David,PhD	Research Associate Professor	Pharmacy	PORPP (30%) PharmD (20%)	Generalized linear models, the analysis of longitudinal data and mixed models.
Boudreau, Denise, PhD	Affiliate Associate Professor	Pharmacy	PORPP (20%)	Determinants and risks of long term opioid therapy, impact of commonly used medications on breast cancer outcomes, and cost of false positive mammography
Bresnahan, Brian, PhD	Assistant Professor (Adjunct)	Radiology Pharmacy	PORPP (5%)	Economic evaluation of a carpal tunnel syndrome study and assessing how payers define and evaluate medical product value in their decision-making processes
Devine, Emily Beth, PharmD, MBA, PhD	Research Associate Professor	Pharmacy	PORPP (30%) PharmD (20%)	Evaluating the impact of electronic health records on medication safety, clinician workload efficiency, and the perceptions and attitudes of clinicians that influence adoptation of electronic health records; warfarin-induced coagulopathy
Gardner, Jacqueline, PhD	Professor	Pharmacy	PORPP (35%) PharmD (35%)	Impact of pharmacists' interventions on health outcomes
Garrison, Louis, PhD	Professor	Pharmacy	PORPP (60%) PharmD (5%)	National and international health policy issues, economic evaluation of pharmaceuticals and diagnostics
Hazlet, Thomas, PharmD, DrPH	Associate Professor	Pharmacy	PORPP (50%) MSBRA (25%) PharmD (20%)	Drug regulation, pharmaceutical policy, and bioethics
Kadiyala, Srikanth, PhD	Assistant Professor	Pharmacy	PORPP (60%) PharmD (5%)	Genetics and health insurance markets, managed care and prevention, behavioral economics and quality of medical care
Shen, Danny D., PhD	Professor, Chair	Pharmacy (Pharmaceutics, Fred Hutchinson Cancer Research Center)	PORPP (10%) Pharmaceutics (10%) PharmD (6%)	Adverse drug interactions between opioid analgesics and herbal supplements; mechanisms of CYP enzyme induction and inhibition by natural products and impact on drug therapy in cancer
Ramsey, Scott, MD, PhD	Professor	Medicine and Pharmacy (Adjunct) (Cancer Outcomes Research Program, Fred Hutchinson Cancer Research Center)	PORPP (5%)	Methods for economic analyses alongside clinical trials, cost-effectiveness of genetic screening for hereditary colon cancer, quality of life for cancer survivors, and quality of life for colon cancer survivors
Stergachis, Andy, PhD, RPh	Professor	Epidemiology and Pharmacy (Adjunct)	PORPP (30%)	Pharmacoepidemiology and other studies of medications and health systems and outcomes; epidemiology of biological and chemical hazards
Sullivan Sean D., PhD	Professor, Director PORPP	Pharmacy	PORPP (60%) PharmD (5%)	Technology assessment, medical decision making and economic evaluation of pharmaceuticals
Veenstra, David, PharmD, PhD	Associate Professor	Pharmacy	PORPP (60%) PharmD (5%)	Outcomes research cost effectiveness modeling, pharmacogenomic-based drug therapies

Master of Science in Biomedical Regulatory Affairs (MSBRA)

Name/Degree(s)	Rank	Primary (& Secondary) Appointment(s)	Graduate Program (% effort)	Research Interest
Hazlet, Tom, PharmD, DrPH	Associate Professor	Pharmacy MSBRA	MSBRA (25%) PharmD (25%) PORPP (50%)	Policy analysis, biomedical ethics, performance of "regulators" and consequences of regulation
Feagin, Jean, PhD	Senior Lecturer	MSBRA	MSBRA (50%)	Global health — scientific, regulatory, ethical, and practical issues for provision of healthcare in resource-poor environments
Feldman, Martha, RAC	Affiliate Associate Professor	MSBRA	9 credits/year	Improving understanding of medical device regulatory and clinical issues
Hammond, David, CCRC, CCRA	Affiliate Instructor	MSBRA	9 credits/year	International clinical and regulatory issues
Hayashi, Eric, MBA	Affiliate Instructor	MSBRA	3 credits/year	Business aspects of medical device regulation
Jonlin, Erica, PhD	Affiliate Instructor	MSBRA	3 credits/year	Ethical and regulatory issues concerning embryonic stem cell research and gene therapy clinical trials. Ethical considerations and protocol design for clinical research. Human subjects protection regulations
Loboda, Raisa, MS	Affiliate Instructor	MSBRA	3 credits/year	Medical device risk management
Magee, Sara, BSc	Affiliate Assistant Professor	MSBRA	3 credits/year	Ensure a safe and effective pharmaceutical supply with a particular interest on the introduction of new drugs for debilitating and life-threatening conditions and diseases
Teal, Karen Kurt, PhD	Affiliate Assistant Professor	MSBRA	2 credits/year	Biomedical technical writing