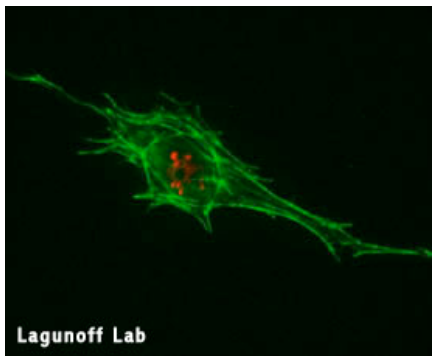
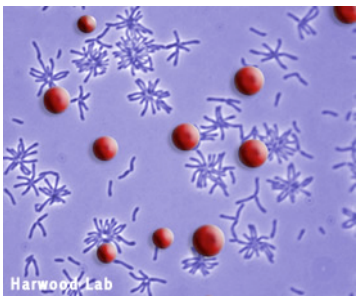
Department of Microbiology
School of Medicine

University of Washington

B.S., M.S., and Ph.D. Degrees

Self Study
Spring 2009





Department of Microbiology
School of Medicine

University of Washington

B.S., M.S., and Ph.D. Degrees

Self Study
Spring 2009

Last reviewed in 2000

Chair and Self-study Coordinator: James J. Champoux

Table of Contents

Section I: EXECUTIVE SUMMARY

A. Mission Statement

The mission of the Department of Microbiology is the discovery and transmission of fundamental knowledge about bacteria and viruses as they relate to each other, the environment, and human disease.

The Department of Microbiology plays a key role in the scientific and teaching missions of the University. It is worth noting, however, that the teaching mission and associated administrative load are quite extensive by comparison with a typical medical school microbiology department. In addition to teaching infectious disease to medical students, the Department is responsible for a stand-alone undergraduate major (offered through the College of Arts and Sciences) and an independent graduate program. Furthermore, the Department offers a number of undergraduate courses that are taken by nonmajors or as electives by students with majors in Biology and Biochemistry. Several of these courses are required as prerequisites for entry into the Med Tech, Nursing, Dentistry, and Pharmacy programs.

To achieve its mission, the Department must provide the resources necessary to enable the faculty to achieve excellence in both teaching and research. A major challenge for faculty members in a research university is to manage the multiplicity of activities required to be a successful teacher and researcher. This is particularly true now when nearly all grant applications must be submitted two or three times before they are funded. It follows that a critical component of junior faculty mentoring should be an emphasis on time-management skills. More importantly, every effort should be made to equitably distribute the teaching responsibilities across the faculty in the Department. Finally, the administration and support services in the Department need to be structured to minimize "busy work" and maximize the efficiency of the faculty.

B. Summary of Self-Study Findings

1. Strengths

The strength of the Microbiology Department lies with the high quality of the faculty and the overall commitment to excellence in both undergraduate and graduate education. Even in these tough economic times, persistence is paying off and the faculty continues to succeed in bringing in grant dollars (Appendix B). There is an expanding realization on the part of the faculty that one must seek out nontraditional funding sources in addition to applying to the usual agencies. Based on student course ratings, the quality of the teaching is overall uniformly high and interest in the Microbiology undergraduate major continues to grow. Finally, our graduate program is among the top ten in the country and continues to attract outstanding students. The advising of graduate students is going very well and a new mentoring program has been implemented for junior faculty. Most of our Ph.D. students are finishing, on the average, in a little over five years. Our recruitment efforts for under-represented minorities to the graduate program are extensive and varied and we are beginning to see some positive results. There is a general sense that to achieve our goals for diversity in the graduate program, it will be necessary to sustain these efforts into the foreseeable future.

2. Concerns

Most of our current concerns center on the scarcity of resources for supporting our programs. Although we do not yet know the exact amount of the State-mandated budget cuts, even the minimum projected amount of 8% will have a debilitating effect on our programs and result in the shift of costs from the State funds to dollars derived from the grant-based indirect costs that are returned to the Department. The net result is that we will be operating with the smallest of margins to support faculty members who are aggressively pursuing every possible grant dollar, including new opportunities resulting from the Federal stimulus package. Importantly, the increased reliance on grant monies to run the Department makes us particularly vulnerable to the loss of grants in the future. Furthermore, since the loss of State funds is permanent, future cuts of this or greater magnitude would require the elimination of classes and impair our ability to fulfill our teaching mission in the University.

Support for first year graduate students is another budgetary concern. Funds to support first year graduate students during their rotations are derived from the indirect cost recovery from grants and a 25% tax on faculty salaries. However, not all of the faculty entitled to take graduate students have grants administered by the Department or derive their salaries from Department budgets. This has been a long-standing problem without easy solutions. However, efforts are currently underway to establish new financial models for dealing with this issue.

Between 2002 and 2007, the morale among the faculty waned and there was a general perception that support from the Medical School was lacking. Three of our faculty were asked to move from newly remodeled space to other laboratories to allow yet another space renovation on behalf of a different department. There seemed to be no concrete plan to provide space for these faculty or other faculty occupying temporary space at disparate sites in the Health Sciences. During Pete Greenberg's tenure as Chair, through no fault of his own, the space situation seemed to worsen rather than improve. With no specific plans to address impending teaching needs resulting from faculty retirements, and the uncertainties concerning future space and leadership, the level of dissatisfaction at the faculty level was very high.

More recently, morale in the Department has improved substantially. In 2007, the University provided the resources for new faculty recruitments and $23.5M for the remodel of the first two floors of the J-wing (32,000 ASF). This commitment of new space that will adjoin space in the K-wing already occupied on a permanent basis by five faculty members is helping to re-energize the faculty. Thus the immediate future is focused on the design and remodel of the J-wing space and the recruitment of new faculty to join those faculty who will move into the remodeled laboratories. Michael Katze is spearheading an effort to leverage existing funds and stimulus monies to establish a Systems Biology Center for Translational Infectious Disease Research. Conversations are underway to include this initiative as part of an infectious disease focus in the next building to be constructed at the South Lake Union campus. Given these new developments and a renewed vision and confidence, there is a growing sense of community in the Department of Microbiology. The future seems very bright indeed.

Section II: ORGANIZATION AND GOVERNANCE

A. Organization

An organizational chart for the Department of Microbiology is provided in Appendix A (Chart 1) which shows how the administrative responsibilities are allocated within the unit. The Administrator, Sheryl Vick, reports to the Chair and provides administrative oversight for Department operations. She and the Chair partner to develop strategic plans for the fiscal and managerial activities of the Department. Appendix A (Chart 2) shows the academic and geographic distribution of the faculty. Five faculty members are located off campus at the Rosen facility at South Lake Union. Lisa Caprina ably serves as the Rosen Manager to oversee operational activities at this facility. Although the presence of two locations does require some redundancy in administrative functions, we are successfully building a more integrated administrative environment. The Student Advisor, Sarah Mears, deserves special mention since she provides all of the administrative support for both the undergraduate and graduate programs and in addition is the undergraduate academic advisor. She also plays a critical role in graduate student recruitment each Winter Quarter.

Departmental governance depends heavily on a committee structure which is described in Appendix A (Chart 3). For the most part, these committees function independently and report the results of their activities to the Chair and in many cases to the remainder of the faculty at monthly faculty meetings. Where appropriate, graduate students serve as full voting members of the committees (noted in chart). Additional input from graduate students concerning Departmental issues directly affecting the students is encouraged through quarterly meetings with the Chair. Graduate student involvement in most aspects of governance is regarded as important for both the Department and the students.

B. Budget

An analysis of the Departmental budget of approximately $21 million per annum for the past four years is shown in Appendix B, Figure 1. The budgetary amounts are broken down according to revenue sources: Grants and Contracts (includes return of indirect costs referred to as Research Cost Recovery or RCR), State, Other (hospital, cost center, R&T) and Gifts. Two important conclusions can be drawn from these data. First, during this time the total operating dollars have remained relatively stable. Second, the major source of revenue in support of the activities of the Department comes from grants and contracts. Figure 2 in Appendix B shows the salary breakdown according to the source. Staff salaries are mostly paid from grants and contracts while faculty salaries are more evenly distributed between grants and State funding. Since most of the State revenues are dedicated to faculty and some staff salaries, the revenue for day-to-day operations of the Department that are not covered by Direct costs from grants and contracts (support staff, supplies and communications services, graduate student first year stipends, facilities maintenance, IT support, and salaries for WOT faculty) must come from the indirect costs returned to the Department (RCR), and the "tax" on faculty tenure-line salaries (referred to as the A component), currently set at 25% and paid from grant funds.

Importantly, both the RCR and the 25% A component tax are linked to our ability to bring in grant dollars. In times of diminishing grant funds, the loss of resources from these two sources can place an undue strain on the finances of the unit. Furthermore, the current budget crisis in the State of Washington translates to anticipated cuts of 10% or more in the State-derived funds available to the Department and these cuts must be absorbed without faculty layoffs or salary reductions. Plans are being made to manage these budget cuts, but any future cuts in State-derived revenues will certainly result in significant reductions in our ability to deliver educational services to the University community at the current level. Fortunately, owing to the success of the faculty in obtaining and sustaining external grant support, we project modest increases in RCR funds in the coming few years. It should be noted, however, that with the cuts at the State level, some future costs will have to be shifted from the State to the RCR revenues, making the Department even more vulnerable to the effects of loss of grant funds in the future.

C. Resources

The budgetary uncertainties noted above present the leadership and the faculty of the Department with major challenges in the coming years. The Chair and the Administrator review the financial picture in the Department on a regular basis and continuously adjust plans for the future to most efficiently match anticipated needs with projected revenues. In the past year, efforts to consolidate administrative support functions and provide cross training to individuals has enabled an overall reduction in support staff without compromising services. In these times of uncertain resources, we will need to continue such efforts well into the future.

Efforts to identify new sources of funding for Departmental programs are ongoing, and we expect these efforts to continue and to bear fruit in the future. Through the generosity of three faculty members in the Department, UW matching-fund endowments were established in the last two years that will provide annual awards for (i) travel of a graduate student to visit another laboratory for specialized training (Falkow Award), (ii) an undergraduate who excels in a teaching capacity within the program (made possible by Denise Anderson), and (iii) a postdoctoral trainee-hosted seminar (Nester Award). See Appendix H for a description of other ongoing awards for both undergraduate and graduate students.

Support for graduate training is a high priority and we will redouble our efforts to find additional resources to cover the stipend costs in this era of shrinking federal dollars. In this regard, some months ago, Julie Overbaugh (Affiliate member of the Department, located at the Fred Hutchinson Cancer Research Center) spearheaded an NIH training grant application in the area of virology that was submitted through the Department. Despite being the first submission, we obtained a score of 149, which is close enough to the anticipated pay-line that it may be funded. By far, the greatest challenge is to find additional reserves to support our first year graduate students during their rotations. Although we have grant funds and training grant positions to cover the stipend and tuition costs for more than the 5-7 students we admit each year once they start their second year of training, we lack the resources to fund more than this number during the rotations in their first year.

D. Staffing

1. Encouraging and enhancing productivity of members of the Department

Supervisors provide regular feedback, coaching and training, and formally provide annual performance reviews for all staff in the Department. Performance goals are outlined during the review process and the Administrator is available to provide assistance in all personnel matters. Administrative staff meet regularly to solve business problems, gain cross training skills, and brainstorm new methods and procedures for improving office and support services efficiencies. Staff are also able to enroll in courses to improve and expand their skills. A variety of classroom and online courses aimed at enhancing work performance are offered through the Professional and Organizational Development Division of the UW Department of Human Resources. In addition, the entire administrative staff meets quarterly as a group called the MASTERS (Microbiology Administrative STaff Experts in Responsive Service) to better understand the work of the Department and its importance as well as to celebrate individual and team accomplishments. This year the department was proud to nominate Cyndy Baker, Manager of Program Operations for the Katze Laboratory, for the University of Washington Distinguished Staff Award. This award recognizes exemplary service and the extraordinary accomplishments and contributions the individuals make to their departments and the University.

Faculty performance reviews are carried out according to the schedule mandated by the Faculty Code: every year for Assistant Professors, every two years for Associate Professors, and every three years for Professors. During these reviews past performance and future expectations are discussed. Such sessions provide an opportunity to discuss teaching plans and the research needs of the faculty. Faculty recognition for excellence in research most notably comes from sources external to the University (grant and paper reviews, invitations to meetings, solicited review articles, membership on study sections or editorial boards, and membership in societies). However, selection by the School from a list of nominees to present a Science in Medicine Lecture is one internal means of recognizing the accomplishments of individual faculty members. In recent years, Lalli Ramkrishnan, Ram Samudrala, Sam Miller, and Brad Cookson have been selected for this honor. In addition, a number of our faculty have been nominated for the university-wide Distinguished Teaching and Mentoring Awards.

2. Decision making processes and criteria for salary increases, retentions, and promotions

In accord with the Faculty Code, faculty members senior in rank to Assistant and Associate Professors meet to advise the Chair concerning annual merit salary increases. Full Professors are invited to provide input to the Chair regarding merit increases for Professors. Merit salary increases are based on overall performance taking into account research, teaching, and service. By faculty vote, the following policy has been adopted regarding faculty retention packages: "Matters concerning retention will be at the discretion of the Chair".

Except in the cases of mandatory consideration for promotion from Assistant Professor to Associate Professor (with or without tenure), all Assistant and Associate

Professors must be reviewed annually by faculty senior in rank for possible promotion. In the case of a mandatory promotion or when a preliminary review indicates that there is sufficient evidence to merit a full consideration for promotion, the candidate is asked to provide a self assessment which addresses the individual's contributions to the Department and the University in teaching, research and service. The self assessment document, along with student and peer evaluations of teaching, and both internal and external letters of recommendation, constitute the promotion materials that are reviewed by the senior faculty in reaching a promotion decision. If there is a positive departmental vote, the promotion packet is forwarded to the Dean of the School of Medicine together with a cover letter from the Chair with his/her recommendation. The proposed promotion must then be approved at the School and Provost levels before it can become effective.

An abridged version of the criteria for promotion to Associate Professor is presented below (excerpted from the Departmental Appointment and Promotions Guidelines).

> **Teaching.** Appointment or promotion to associate professor requires evidence of effectiveness and success in promoting learning and stimulating an inquisitive and scholarly attitude in students. Teaching may include classroom education of undergraduate and graduate students (including medical students) as well as in-laboratory training of graduate and postdoctoral fellows. Promotion requires that annual student evaluations be on file, along with a peer evaluation of classroom teaching at least once during the two years preceding consideration of promotion.
>
> **Research**. Appointees are expected to have established a substantial record of accomplishments in research as evidenced by published scholarly work. The research must be known outside the University of Washington, and the opinion of leaders in the particular scientific field must be solicited about the quality and potential of the faculty member as an independent investigator. The faculty member must have a record of presenting his/her work regularly at national scientific meetings. He/she is expected to be the primary or senior author of a reasonable number of papers. Evidence must exist that the faculty member will maintain a funded, active, and independent research program.
>
> **Service**. Appointees will have evidence of commitment to the general activities of the department, school, University and/or government and non-government organizations and community. Within the University, this is evidenced by service on departmental and possibly school or University wide committees. Service on review boards and study sections are examples of service at the national level.

An abridged version of the criteria for promotion to Full Professor is presented below (excerpted from the Departmental Appointment and Promotions Guidelines).

> **Teaching**. Appointment or promotion to the rank of professor is based on the quality of his/her contributions and on their effectiveness in improving the teaching program. This includes leadership in the educational mission of the school or department. Such contributions to teaching must be documented in a manner similar to that described for appointment to Associate Professor.

Research. The overall published output of the appointee must show evidence of having significantly advanced the field of scientific inquiry in which he/she is involved. Evidence for originality and important discoveries are the most valued elements in the published output. The national recognition of the faculty member's work may be reflected by the publication of invited chapters and reviews that put into perspective the advances in a particular scientific area. Evidence must exist that the appointee will maintain a funded, active, and independent research program. Faculty members receiving appointment to the full professor level play a sustained role in national and international organizations or meetings in their own areas of investigation or scholarship.

Service. An appointee at the professor level is expected to have served on departmental and school or University-wide committees or councils (e.g., Faculty Senate). Positions of leadership in professional societies, national committees, review groups (e.g., study sections), editorial boards, etc. are other indications of the national status of a faculty member.

Section III: FACULTY, TEACHING, AND DEGREE PROGRAMS

A. Teaching Responsibilities

Faculty teaching responsibilities are determined by the Chair after careful consideration of the needs of the Department and in consultation with the faculty. While it is the general policy of the Chair that all faculty members contribute to the teaching mission of the Department, it is recognized that this mission includes the mentoring of graduate students and postdoctoral trainees as well as formal classroom teaching. Also included is the training of medical students and residents as a part of some Microbiology faculty clinical responsibilities. In addition, faculty members "without tenure for reasons of funding" (WOT) necessarily must obtain a greater proportion of their salaries from grant funds and accordingly provide more mentoring and advising of graduate students in addition to their classroom teaching. Teaching assignments take into account the interests of the faculty, their rank, their areas of expertise, their classroom experience and teaching skills, and their relative load of research-related and service activities. Given the need to balance these competing activities, the teaching responsibilities are determined on a case-by-case basis for all faculty members and in the end the relative amount of time spent on research, teaching and service will vary from one faculty member to another. See Appendix C for a listing of faculty teaching for 2008-2009. To better reflect the overall faculty contributions to graduate courses, some of which are taught every other year, and to incorporate recent changes in teaching commitments, the projected teaching contributions for the 2009-2010 academic year are also included in Appendix C.

Statements regarding Departmental teaching from the 2000 report of the Review Committee are excerpted below:

"For some time, the responsibility for teaching has been distributed extremely unevenly among the Department's faculty. This has given rise to an unhealthy two-class system in which some faculty feel that their success at raising research funds should shield them from being required to teach..."

"A high priority should be to dismantle the two-class system which already exists among the member of the department with respect to teaching. Since the present teaching loads of the faculty most heavily involved in teaching are not excessive when compared to other institutions, this should be done by increasing the teaching loads of those whose involvement is modest or insignificant without necessarily decreasing the loads of those who currently play an active role in the teaching program."

Although there is still room for improvement, to a large extent this recommendation has being implemented. In particular, several faculty members have agreed to take on new teaching beginning in the next academic year. Pete Greenberg and John Mittler will be revamping the undergraduate course in Microbial Ecology (Microm 435), Lalli Ramakrishnan will organize for the first time the graduate course in Molecular Mechanisms of Bacterial Pathogenesis (Microm 553), Jim Mullins has agreed to teach the Microbiology half of Biol 200, an introductory course in biology for majors, Michael Katze will be resurrecting the graduate course in Virology (Microm 540), and Evgeni Sokurenko will be teaming up with recent retiree Jim Staley to offer a new conjoint course in Microbial Evolution and Ecology (Conj 557). These changes and revisions have been implemented to achieve a more balanced distribution of teaching while still recognizing the need to make each individual's teaching compatible with his/her other professional activities.

B. Instructional Effectiveness

Effective classroom teaching is at the core of our educational mission and a variety of tools are used to monitor the overall quality of our teaching. Student ratings are collected for all of our undergraduate courses using the forms provided by the UW Instructional Assessment System. The results are returned to the instructors and copies are forwarded to the Chair. Typically, these evaluations involve a standardized "bubble-in" questionnaire along with an opportunity for the students to provide additional feedback in a narrative form. The averages of the first four items on the questionnaire are provided in the OAP summary in Appendix D under "Student Evaluations of Instructional Quality" where the scores range from 0 to 5, with a score of 5 being excellent. The five-year average score of 4.2 is indicative of the excellent quality of the teaching within the Department. In addition to these standardized forms, senior faculty are asked to sit in on one or more lectures and provide a written summary to the faculty member and the Chair describing in detail the quality of the lecture, the preparation of the instructor and the rapport with the students. The standardized forms are not commonly used for graduate classes and instead an informal questionnaire developed by the instructor(s) is used to solicit feedback from the students. Each instructor receives the responses relating to her/his portion of the course.

The information obtained from teaching evaluations are used in a variety of ways. Both the student ratings and the peer review letters serve as the basis for the evaluation of teaching during performance reviews, at the time of promotion, and during merit reviews. In cases where a faculty member is having difficulties with some aspect of teaching, both formal (See Appendix I) and informal mentoring is provided and suggestions are made concerning the types of opportunities for professional

development that are available within the University. Finally, the ratings inform decisions regarding the staffing of both undergraduate and graduate student courses.

Graduate student teaching is an important component of our Ph.D. training program (Appendix J). In the first and second years, graduate students are required to TA for two quarters in Microbiology undergraduate laboratory courses. Oversight for these laboratory courses is provided by the Senior Lecturers in the Department (Denise Anderson, Mark Chandler, Janis Fulton, and Kendall Gray) who also provide individualized feedback to the TAs. In addition, the TAs are evaluated each quarter using the student ratings system described above. Sometime during or after their third year, graduate students are also required to present two formal lectures in an undergraduate class. They must approach an instructor of the class to arrange the teaching and to seek advice concerning the planning and delivery of the lectures. One class which is particularly suitable for this experience is Microm 431, Prokaryotic Recombinant DNA Techniques, because Mark Chandler, the Senior Lecturer responsible for the class, listens to each graduate student's lecture and provides feedback on the student's performance before he or she gives the lecture to the class.

C. Teaching and Mentoring Outside the Classroom

1. <u>The undergraduate student learning and development experience</u>

An undergraduate's first contact with the Department is often Sarah Mears, the Department's academic advisor. She explains the requirements for a B.S. degree, helps the students plan their course of studies, and processes the necessary paperwork for graduation. She assigns each student to a faculty advisor who provides academic advising and career counseling where appropriate. In general, Ms. Mears carries the major burden of student advising in the Department. One area for future improvement is to more actively engage the faculty in the advising process.

The Department offers a number of opportunities for undergraduates in the B.S. program to experience learning outside of the classroom. A library research project mentored by a faculty member (Microm 496) is a graduation requirement and involves a literature search on a chosen topic and the submission of a 10-12 page paper describing the state-of-the-art in the field of choice. Students may elect to engage in undergraduate research for which they receive academic elective credit (Microm 499 or for honors, Microm 495). Interested students are apprised of the research option through the advising process and encouraged to explore research opportunities directly with faculty. Many adjunct and affiliate members of the faculty are active participants in the undergraduate research program. This option is especially attractive for students aspiring to go to graduate school or who anticipate a career in research, but it is demanding and time consuming (10-20 hours per week) and generally extends over several quarters. Nonetheless a substantial number of our undergraduates participate in undergraduate research for at least two quarters. The numbers were 64 and 54 in the 2006-2007 and 2007-2008 academic years, respectively. This means that better than a third of our undergraduate majors benefit from research experience in a lab. Besides providing an excellent opportunity for our undergraduate students to experience first-hand the excitement of research, the undergraduate research program

also provides an opportunity to engage committed graduate students and postdocs in the mentoring process.

The Departmental Honors Program provides an opportunity for those students who are not members of the College of Arts and Sciences Honors Program to complete the honors curriculum and receive a B.S. degree with "Distinction in Microbiology". Members of the Arts and Sciences Honors Program who choose to major in Microbiology must also complete the requirements of the honors curriculum. Besides completing all of the other requirements for the Microbiology degree, students in the honors curriculum must maintain a cumulative GPA of 3.3, carry out an undergraduate research project (minimum of six credits) and write an honors thesis (Microm 496) based on their research experience. In 2008, five students graduated with honors out of a total of 49 graduates. Finally, many course instructors permit College Honors Students to take individual courses *ad hoc* honors.

2. The graduate student experience

Today, perhaps the single most effective tool for initially attracting applicants to a graduate program is a well-designed, informative, and up-to-date departmental web site. We continue to make strides in establishing procedures for updating our web site on a regular basis. Potential applicants consult many other resources as well, and the fact the Department ranks among the top 10 microbiology graduate programs in the nation certainly contributes to the large number of applications from all across the country that we receive each year (147 in 2008). Judging from the GPAs, the GRE scores, the quality of the undergraduate institutions, and the research accomplishments, the applicant pool generally has 25-30 individuals who meet our standards for admission (Appendix D). We set an enrollment target based on the Departmental funds available to pay the stipend and tuition for the first-year student rotations and adjust the number of offers based on past experience with acceptance rates. In these times of limited resources, the enrollment target is 5-7 students each year, which is below the number of students that could be assimilated into faculty labs as grant-funded RAs. A challenge for the future is to establish a more stable funding base for our first-year student stipends.

The curriculum requirements for a Ph.D. degree in Microbiology are described in detail in Appendix J, and the Graduate Program Guidelines are presented in Appendix K. Together, these documents provide the students with the requirements and guideposts for navigating through the program. Among other items, the Guidelines contain the advising and mentoring policies, procedures for choosing rotations and an advisor, the program deadlines, and the formats for the examinations and the thesis. The Graduate Policy and Advising Committee is responsible for revising the Guidelines and advising the students in the first year prior to their entry in a lab. A table showing the advising schedule can be found on the first page of the Guidelines (Appendix K). At the end of each academic year, the training faculty meet to review the progress of each student in the program. This oversight serves not only to ensure the timely progress of each student, but gives the faculty an opportunity to work together for the benefit of any student who is struggling. We believe our policy of "mentoring for success" gives our students the best possible chance to flourish as graduate students and the preparation to be highly productive microbiologists after graduation.

A brief description of the Department's graduate training program follows: The first year students do a laboratory rotation in each of the first three quarters (Autumn, Winter, and Spring) and take classes. The class work involves a combination of Microbiology graduate courses and Conjoint courses (5 week minicourses) offered by the basic sciences departments in the School of Medicine and the Fred Hutchinson Cancer Center. At the end of Spring Quarter, the students choose a laboratory for their Ph.D. thesis research. In the second year, the students finish their class work and take the Topic Qualifying Exam. The students must fulfill the two-quarter TA requirement by the end of the second year. At the beginning of the third year, the students take the General Exam. This involves the preparation of a written thesis proposal in the NIH format and an oral exam where the proposal is defended. After the General Exam, research progress is monitored by annual meetings of the student's Ph.D. supervisory committee. The students are provided with written feedback at the end of the Qualifying Exam, the General Exam, and after the annual committee meetings. Once a draft of the thesis is approved by the student's reading committee, the final exam involves a public presentation of the thesis work with questions. The table on page 9 of the Guidelines (Appendix K) provides the students with a list of the critical deadlines they must meet during the course of their studies.

Several requirements of the program deserve special mention. At the end of each rotation, the first year students present a short (15-20 minute) talk to everyone in the Department describing the objective and results of their rotation project. Beginning in 2009, all first-year students are required to take a bioethics course taught jointly by Microbiology and Biochemistry faculty. Those students who successfully compete for a position on a training grant must, in addition, satisfy the training grant requirements and take the UW Biomedical Research Integrity series offered annually by the Department of Bioethics and Humanities. In addition to TAing two laboratory courses, all students present two (or more) formal lectures in undergraduate microbiology courses in their third or fourth years. The Journal Club requirement (Microm 522) provides students in the third year and beyond with additional experience in public presentations. Finally, a strict requirement for the Ph.D. degree is to publish at least one first author paper in a refereed journal. We believe the integration of teaching and research throughout the training years prepares students very well for a career either in academia or in the one of the many non-academic options available to today's Ph.D. in microbiology. To increase their awareness of their professional options, our students are encouraged to attend the monthly Bioscience Career Seminars at which speakers with Ph.D. degrees in the Biological Sciences discuss alternative careers choices (http://courses.washington.edu/phd/).

3. Training and support for other roles of graduate student service appointees

During the orientation period prior to the start of their first year, the students take a number of classes and workshops to prepare them for success in both TAing and laboratory research. The UW Center for Instructional Development and Research (CIDR) puts on a TA Conference on Teaching and Learning each Autumn Quarter. In addition to a Plenary Session entitled "Teaching at the UW: Policies and Professionalism", the students choose three workshops from the following list:

- Activities to Engage Your Students in Learning

- Balancing Graduate School Demands
- Presenting Information Effectively
- Teaching in Lab Settings: First Day and Beyond
- Teaching One-to-One in Office Hours and Study Centers
- Dealing with Difficult Classroom Situations

The Microbiology Senior Lecturers also meet with the first year students during orientation to familiarize them with the TA procedures that are unique to the teaching of the Departmental undergraduate laboratories. CIDR also puts on a Research Assistant Workshop that involves a panel discussion around many of the day-to-day issues confronting a graduate student at the UW.

The students also take a number of laboratory safety seminars arranged by the UW Department of Environmental Health and Safety. These include training in the handling of hazardous chemicals, safe laboratories practices, fire extinguisher use, and radiation safety. As appropriate, specialized classes are available in the handling of blood-borne pathogens and biosafety training.

Prior to registration, the first year students meet with a Microbiology faculty member and two graduate students (one senior and the other a second year student) to develop a course plan for their first two years of study. This course-advising workshop provides an opportunity for the students to learn about the available courses and make plans that are consistent with their interests and prior academic experience.

D. Degree/Certificate Programs

Degrees Offered	Other Options Available
B.S. degree	(1) Minor (2) Microbiology honors: "With Distinction" (3) Double degree with Medical Technology
M.S. degree	Only available to students who leave the program prior to completing the Ph.D.
Ph.D. degree	(1) Certificate in Astrobiology (2) Certificate in Computational Biology (3) Certificate in Molecular Medicine

1. B.S. degree

The requirements for a major and a minor in Microbiology are outlined in Appendix L. The honors program "With Distinction" in Microbiology has been briefly described above (Section III.C.1.).

The Departments of Microbiology and Laboratory Medicine jointly offer a five-year program leading to a B.S. in both Microbiology and Medical Technology. Graduates of this program are eligible for certification as Medical Technologists and are employed in a variety of medical specialties performing clinical laboratory tests on blood

and tissue samples. Opportunities for employment include hospitals, medical laboratories, research laboratories, and public health facilities. Such individuals are critical to the overall health care delivery in the State and play a key role in providing physicians with the tools required for diagnosis and treatment.

With a bachelor's degree offered through the College of Arts and Sciences and an administrative home in the School of Medicine, the Department of Microbiology occupies a unique position in the University. The undergraduate major significantly impacts the overall faculty workload and the administrative overhead as compared to a typical microbiology department housed in a medical school. Two mitigating factors are worth mentioning. First, Sarah Mears does a superb job as the undergraduate advisor and the primary contact person for all administrative issues that arise in the undergraduate program. Second, the Senior Lecturers in Microbiology (Appendix A-Chart 1) oversee a large number of the laboratory courses without which we simply could not offer the major. Nevertheless, the average lecture load for our faculty is significantly greater than the load experienced by faculty in a typical medical school-based microbiology department (see Appendix C).

The number of Bachelor's degrees awarded (45-50) has remained relatively constant over the past 10 years (Appendix D), despite steady increases in the number of enrolled majors from the 2004-2005 to the 2007-2008 academic years (Appendix G, HEC Board Summary). Currently there are 170 majors in the program compared to 161 one year ago. This upward trend in the enrollment bears watching since we are at capacity for the entry level course for majors in the program (Microm 410). The numbers would also suggest that more students are now taking longer than two years to complete the major than 5 years ago. In 2008, 25 students graduated with a minor in Microbiology, a three-fold increase from the level in 1998. The number of under-represented minorities electing the major continues to be low (<10%). In addition to increasing enrollments in the Microbiology major, some classes have also experienced substantial increases in enrollment due to pressures from other programs. The classes most affected by increased enrollments are Microm 301, 302, 410, 442 and 445. Microm 410 (Fundamentals of General Microbiology I) in particular represents a critical example of this problem, where enrollment demand exceeds the room capacity year after year.

There are many educational and career choices available to individuals graduating with a bachelor's degree in Microbiology. For those students desiring further education, they can choose to go to medical, dental, pharmacy, nursing, or graduate school. Others may choose to seek master's degrees in public health, epidemiology, science writing, or business. Even without further education, the microbiology graduate is highly qualified for technical jobs in academia, research institutes, pharmaceuticals, biotechnology, clinical laboratories, and hospitals. In the past five years, three Microbiology graduates have chosen to do Emerging Infectious Diseases Internships at the Center for Disease Control. Others may choose to capitalize on their science backgrounds to go into patent law, forensics, or industrial consulting, just to name a few possibilities.

The importance of well-trained individuals in the field of microbiology to the State and the nation cannot be overstated and the UW Microbiology Department is paramount

in preparing the next generation of scientists to fulfill the region's needs in this regard. Infectious diseases will continue to present major health challenges into the foreseeable future and the emergence of drug resistance and new types of chronic infections only exacerbate the problems. The work of microbiologists is central to the understanding, diagnosis, and treatment of bacterial and viral diseases. Microbiologists play a key role in identifying, developing, and testing new antimicrobial drugs. Through genetic engineering and a basic understanding of bacteria, microbiologists will contribute new solutions to old problems such as water pollution, and develop new technologies for the generation of alternate materials and energy sources for the future. Microbiologists will continue to be at the forefront in the use of bacteria and viruses to develop new genetic tools for the study and treatment of disease. Microbiologists will play a key role in the future development of nanoscale machines that will have many industrial and medical applications.

The learning goals of the B.S. program are to teach (i) critical thinking, (ii) problem solving, (iii) quantitative reasoning, (iv) a fundamental knowledge of microbiology, (v) an understanding of key concepts, (vi) an appreciation for scientific methodology including the scientific method, and (vii) the ability to engage in scientific discourse, both written and oral. At the time of graduation, majors are asked to fill out a questionnaire that asks about their satisfaction with their training and their future plans (see Appendix M). The data derived from the survey should be useful in evaluating outcomes in relation to some of the goals stated above. Classroom performance and feedback regarding the independent study courses (library research and undergraduate research) provide additional metrics for evaluating our performance as instructors. Unfortunately, these data have been overlooked in recent years and not subjected to any kind of systematic analysis. This oversight will be addressed in the near future by the Undergraduate Committee. Additional insights about our overall performance can be gleaned from surveys taken one year after graduation by the Office of Educational Assessment. The following results were taken from the "Graduate Survey Results 2005" (the most recent survey available) where the response rate was only 24% (11 out of 46 graduates). Given the low response rate (similar to the campus-wide rate of 23%), caution must be exercised in interpreting the results, but for the particular points made below, it should be noted that the results were similar to those from the preceding survey taken in 2003. Ten out of 11 respondents said if they had to do it over again, they would choose to go the UW. When asked about their satisfaction with the UW's contribution to their development in "understanding and applying scientific principles and methods" the mean score was 4.8 (out of 5). Similarly high rankings were given to questions regarding the UW's contribution to "working and/or learning independently" (4.4) and "using knowledge, ideas, or perspectives gained from major field" (4.3). Finally, they ranked the "quality of instruction in your major field" as a 4.3. For all of these metrics, the rankings for microbiology majors was significantly above the mean rankings for all of the students in the College of Arts and Sciences.

The results of a recent review of the undergraduate program carried out by the Undergraduate Curriculum and Advising Committee can be summarized as follows: The quality of the students in the program remains overall very high and there has been little or no grade inflation over the past 10 years. It was decided to require a minimum grade of 2.0 in Biol 200 (Introductory Biology) for entry into the major and for taking 400

level microbiology classes. These changes are designed to reduce the number of students who are poorly prepared for success in our courses. Name changes were suggested for Microm 443 (from Medical Microbiology Lab to Medical Bacteriology Lab) and Microm 412 (from Fundamentals of General Microbiology III to Prokaryotic Diversity) which will be implemented in the near future. It was suggested that Microm 435 (Microbial Ecology) be revised and updated, and this change will be implemented next year with Pete Greenberg and John Mittler as the instructors.

2. M.S. degree

The Department does not admit students directly into a Master's degree program. However, occasionally a student leaves the Ph.D. program either for personal reasons or because they do not pass the General Exam. If the student has satisfactorily completed two years of graduate study at the time of departure, he/she may be granted a non-thesis Master's degree. The requirements are outlined in the Graduate Program Guidelines (Appendix K). One M.S. degree has been awarded in each of the past three years (Appendix G)

3. Ph.D. degree

The curriculum and graduation requirements for the Ph.D. are available in Appendix J and the Program Guidelines can be found in Appendix K. The program description, exam formats, mentoring, and milestones, are provided in Section III.C.2. The enrollment data presented in the Office of Academic Programs data found in Appendix D and in the HEC Board Summary in Appendix G reflect the overall stability of the program over the past few years.

One of the hallmarks of the Ph.D. program is the diversity of research opportunities available to the students, ranging from molecular genetics and ecological studies to mechanisms of viral and bacterial pathogenesis. The availability of the certificate programs in Astrobiology and Computational Biology provide additional research opportunities for which the students receive recognition at the time of graduation. For both certificate programs, students must complete all of the requirements of the Microbiology Department plus the requirements of the specific program which involves additional coursework and may involve a laboratory rotation. In addition to these certificate programs, there is a joint Ph.D. program in Microbiology and Nanotechnology. Medical students enrolled in the Medical Scientist Training Program (M.D./Ph.D.) may elect to train in Microbiology laboratories. Finally, some of the graduate students in the interdisciplinary Molecular and Cellular Biology Program also train with Microbiology faculty.

We regard Ph.D. training as an apprenticeship in the conduct of research at all levels, starting from the conception of ideas, to the design of experiments and the critical interpretation of results, and ending with the publication of peer-reviewed papers. The goal of the Ph.D. training is that the graduate will be an intellectual leader who is capable of carrying out independent research and who is skilled at communicating new ideas to a trained audience. The ratings of student satisfaction in exit surveys (five year average, 4.3 on a scale of 1-5) suggest we are meeting the needs of our students. When asked to rate the "overall quality of the program", the average ranking over the last five years (21 respondents to exit survey) was 4.4 out of 5.

The Graduate Policy and Advising Committee reviews and updates the Guidelines on a regular basis in response to changing policies approved by the faculty. Graduate student suggestions and feedback are solicited in the course of these revisions to the guidelines and policies. The last major update was in November 2008 when the requirement for biomedical ethics training was added, along with a detailed description of the thesis format. Tables showing the mentoring schedule along with the deadlines for the various stages of the degree were also added at that time.

Our peer institutions with respect to graduate student recruitment are the University of Wisconsin, Washington University in St. Louis, University of Michigan, UCSD, University of Illinois, Stanford University and UCLA. The Department ranks among the top departments in the nation in obtaining federal grant funds (see Section V.A.).

The Ph.D. program in Microbiology trains individuals to be the intellectual leaders of the future in academia, research, medicine, business, ecology, and technology. These individuals are indispensable members of the scientific community who carry on the legacy of discovery and innovation.

4. Service courses and general education requirements

The Microbiology Department also offers courses that are taken by nonmajors. Microm 301 is a survey course of microbiology principles for nonmajors interested in learning more about the field. It is not uncommon for students who have taken Microm 301 to decide to pursue a B.S. degree in Microbiology. Microm 301 is also a prerequisite for the Nursing, Pharmacy, Dental, and Physical Therapy programs and is a requirement for the Environmental Health program. In the current quarter, 77% of the students taking Microm 301 are fulfilling a requirement for one of these programs. With the increasing interest in these vocations, the demand for this course is close to exceeding our capacity for offering the class. In the coming year, Gene Nester has agreed to be rehired after his retirement at 40% time to enable us to extend our offering of this class from three to four quarters. In the future, it may be necessary to seek resources from other academic units to sustain this key offering. Microm 101 is a basic course in microbiology for non-science majors and can be taken to satisfy general distribution requirements for undergraduates. Since 2003, we have hired Winston Brill, a retiree from the University of Wisconsin and a member of the National Academy of Sciences, to teach this course and its popularity has steadily increased. Owing to financial constraints imposed by the economic downturn, we were forced to discontinue this class this year, but the plan is to reinstate it as soon as resources are available.

Section IV: DIVERSITY

A. Diversity in the Microbiology Graduate Program

Stemming from the dedication of several faculty members, the Department has utilized a number of different approaches for enhancing our recruitment and retention of under-represented minorities (URM's) into both the undergraduate and graduate programs. The efforts of these individuals are described in detail below. While we are beginning to see positive results, we must sustain these efforts to realize our potential for the recruitment of URM's.

Sarah Mears, the Graduate Program Advisor, has participated as a member of the Biomedical Minority Recruitment Task Force to help prepare a booklet entitled "UW Biomedical Research Programs: Surging Ahead With Purpose". This booklet provides a concise overview of 14 graduate programs at the University of Washington along with a description of how to prepare for and apply to graduate school. This booklet is used by all of these programs as a recruiting tool targeting URM's.

1. Recruitment

As seen in the table below, the numbers of URM's in the graduate program has increased in recent years, including a very recent jump in the number of qualified applicants to the program.

Microbiology Graduate Program Under-Represented Minority (URM) Applicants				
Year	**Total Applicants**	**URM Applicants**	**URM Offers**	**Matriculated**
2008	172	14	5	0
2007	128	6	2	1
2006	116	11	2	1
2005	104	12	3	1
2004	121	6	1	0
2003	122	15	2	0

The microbiology program is actively trying to increase both the number of applications of qualified URM's and the ability to recruit them to the UW. To increase interest in microbiology and the number of applications to the undergraduate and graduate programs, the Department has encouraged and supported the activities of the UW Chapter of the Society for the Advancement of Chicanos/Latinos and Native Americans in Science (SACNAS) and has developed courses specifically directed at UW URM's. A Microbiology faculty member, Jimmie Lara, one of the founding members of this national organization, helped organize the UW Chapter of SACNAS, which over the past 2-3 years has conducted a number of important activities on behalf of the UW and the Microbiology Department. With the financial support of the Microbiology Department, together with other departments, SACNAS has overseen several UW graduate recruitment booths at the last two SACNAS National Conference meetings held in Kansas City, Missouri, and Salt Lake City, Utah. SACNAS members and UW faculty representatives have used this opportunity to advertise the various graduate programs at the UW and to interact with prospective students. One of our current URM's in the Lagunoff lab, Tracie Delgado, gives talks to high school students and URM college students in the area through both a local SACNAS chapter and through the STAR program. Tracie also gave a research presentation at the most recent

national meeting and she manned a recruitment booth at SACNAS to talk with students about the University of Washington Microbiology graduate program. This effort directly resulted in an increase in URM applicants as students with whom Tracie spoke applied to our program.

One of the flagship outreach events conducted by UW SACNAS has been to partner with Royal City's High School and Middle School in Eastern Washington to assist students in their science projects. Royal City is a rural community with an agriculturally based economy and the students are predominantly Latino (approximately 80%) and have the potential to be first-generation college graduates. Last year a group of six UW SACNAS members met with 32 students at Royal City High School. The one-day event included presentations and panel discussions about science as a career, attaining an undergraduate education, financial aid and scholarship information, and hands-on activities for the students (strawberry DNA isolation, a pH lab, and a discussion on "what is cancer?"). This event was well received by students, teachers, and parents. On April 17, 2009 a group of Royal City students visited Seattle Biomedical Research Institute and SACNAS members met with them over lunch.

SACNAS has also participated in the Graduate Opportunities and Minority Achievement Program (GO-MAP) Student Summit Meetings to discuss coordinating diversity efforts on campus between student organizations. SACNAS was also invited by the Health Sciences Center Minority Students Program to meet with undergraduate students from Morehouse College who visited the UW to learn more about graduate programs and opportunities on campus. SACNAS members have also volunteered to participate in the Northwest Association for Biomedical Research Speaker Workshops.

In addition to the Department's diversity outreach via SACNAS, one of our faculty members has been active in other efforts to increase diversity via support of our own undergraduate students. Beth Traxler has been the co-PI (PI: Patrick Stayton, Bioengineering) of an NIH-funded training grant for URM undergraduates at the University of Washington (UW-IMSD or University of Washington Initiative for Maximizing Student Diversity). The goal of this program is to increase the number of UW URM students that matriculate into PhD programs in the biomedical sciences (including Microbiology). This program supports these students with supplemental instruction in various "gateway courses" in the basic sciences (during their first two years at UW), and funds stipends for undergraduate research projects for qualified students (during their last two years). Beth Traxler's role in this program has had several important results for the Microbiology Department's diversity outreach. The first is in teaching a Freshman Seminar course each fall (since 2004 as a section of GS197) entitled "Diversity Issues in Science." This has been a popular offering, with enrollments between 10 and 25 students from diverse backgrounds. Representative issues covered in this course include discussions of the Tuskegee Syphilis Study and Kennewick Man/repatriation issues for Native American remains and artifacts. Another important outcome of the UW-IMSD program for the Department has been the placement of several outstanding URM students in the Microbiology research projects in recent years. One of these students (E. Burbank, B.S. Biology 2008; currently, medical student at UW) received a Merck/UNCF undergraduate fellowship, supporting his senior year at UW and his research in the Traxler lab. Additionally, Beth Traxler was the UW

representative at the 2007 Minority Trainee Research Forum in Florida, discussing professional and graduate biomedical education opportunities at UW for a diverse audience of high school and college students.

To promote interest and recruit URM's to the field of microbiology, Jimmie Lara instituted a Summer Microbiology course at the request of the UW SOM Multicultural Affairs Office. Thirty-seven URM students, recruited from throughout the U.S. to attend the School of Medicine and Dentistry Enrichment Program (SMDEP), receive 14 hours of classroom instruction in microbiology. The goal of the course is to introduce students to current topics of medical and health importance that will benefit them in their upper division science courses, and give students a realistic view of instruction they may experience when admitted to a graduate or health professional school. This course has also served as an excellent vehicle to recruit local URM's to our undergraduate major program and three former summer participants are currently undergraduate majors in the Department. For the past two Summers, including this Summer, core faculty participants have included, in order of presentation, Jimmie Lara (bacterial structure and function), Kendall Gray (2-component regulatory systems), Denise Anderson (the immune system), Steve Moseley (bacterial pathogenesis), Michael Lagunoff (viral pathogens), and Pete Greenberg (role of biofilms in pathogenesis; cystic fibrosis).

While trying to increase URM applicants, the Microbiology program is also working on improving matriculation. There is a TOP scholar fellowship that is offered through the Graduate School that is often offered to a highly qualified URM who has applied to Microbiology and provides extra money in the first year as an incentive to come here. In addition, during recruitment, the prospective URM's have breakfast with the Vice Dean of Minority Affairs to discuss issues of URM's at the University of Washington. We also have them meet with current URM's to help them better understand our efforts to increase minority representation in Microbiology.

2. Retention

We are also making sure we retain our URM's once matriculated. The last two URM's to enter the program have been invited to join the STAR program the summer before their first year. This has allowed them to settle into Seattle before the official school year starts and get started on a rotation in a Microbiology lab. Additionally, this gives the students a chance to get a head start in graduate school and also connects them with the minority offices and recruitment efforts. As stated above, one of our URM students who used this program to arrive early now gives talks for the STAR program and other minority programs around UW and the Seattle area. Additionally, the STAR program provides additional travel money to move to Seattle, which significantly helped one of our students move here from Los Angeles.

B. Diversity and Retention of Faculty

A major goal of our Department is diversity. Our recent efforts have yielded few minority applications despite wide-spread advertising and encouraging applications of minorities. Our applicant pool does have a representative population of women and we are cognizant of the need to achieve a balanced representation of women on our faculty. A woman emerged as our top candidate in recent search, but despite our best

efforts, she chose to go elsewhere. It therefore remains a top priority to continue identifying highly qualified women applicants in our upcoming searches.

Section V: RESEARCH AND CREATIVITY

A. Impact of Faculty Research

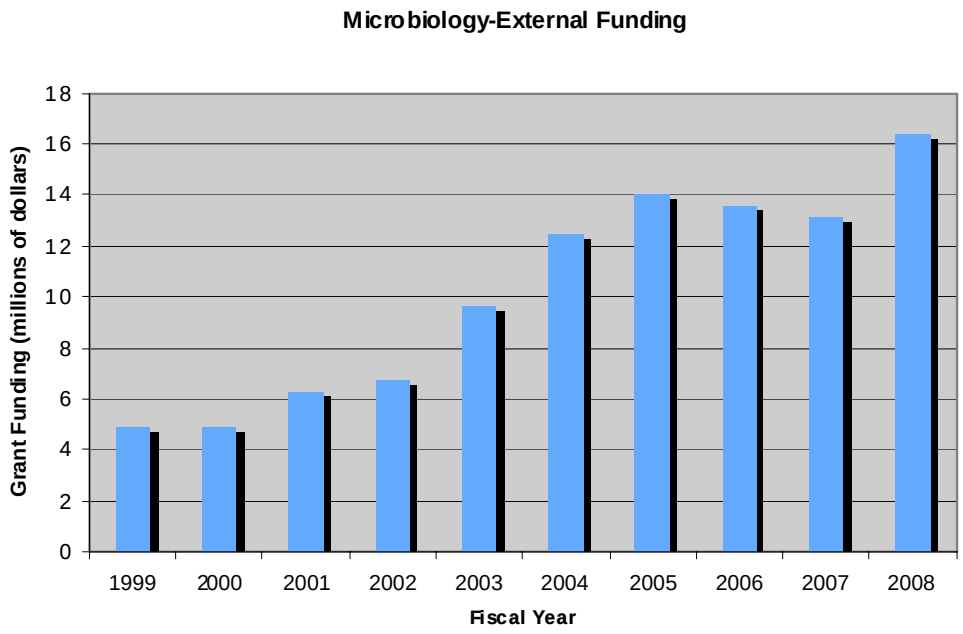
The faculty of the Department of Microbiology has an outstanding record of accomplishment extending over many years. Two members of the faculty are members of the National Academy of Sciences (Nester and Greenberg), four are fellows of the American Association for the Advancement of Science (Nester, Greenberg, Harwood, and Lidstrom) and 7 are fellows of the American Academy of Microbiology (Champoux, Fang, Harwood, Nester, Greenberg, Miller, and Lidstrom). The research interests of core Microbiology faculty members are briefly described in the table below with additional information available in Appendix E (Faculty Biosketches). The contributions of the faculty are diverse in nature and represent cutting-edge research that is published in high profile, peer-reviewed journals. In the years from 1999-2003, the total number of citations of Microbiology faculty publications ranked fifth in the nation. In that same time period, among the top five, the Department ranked only second to Harvard in the number of citations per paper published (13.0 vs. 14.1).

Microbiology Faculty Research

Faculty Member	Rank	Research
Roger Bumgarner	Associate Professor	Genomics and sequencing technologies
Jim Champoux	Professor	Topoisomerases and retroviral replication
Ed Clark	Professor	B Lymphocyte Biology
Brad Cookson	Professor	Immune responses to bacterial pathogens
Richard Darveau	Professor	Innate immunity commensal and pathogenic oral bacteria
Ferric Fang	Professor	Reactive oxygen species, iron and Salmonella pathogenesis
E. P. Greenberg	Professor	*Pseudomonas aeruginosa* biofilms and intracellular communication
Caroline Harwood	Professor	Chemosensory mechanisms in *Pseudomonas aeruginosa* and biological hydrogen production
Michael Katze	Professor	Systems approaches to understanding viral-host interactions
Michael Lagunoff	Associate Professor	Molecular biology of Kaposi's sarcoma herpesvirus (KSHV)

Jimmie Lara	Associate Professor	Ultrastructure of bacteria and viruses
John Leigh	Professor	Gene regulation in methanogenic archaea
Mary Lidstrom	Professor	One-carbon catabolism, global warming and single cell measurements
Samuel Miller	Professor	*Pseudomonas* in cystic fibrosis, Type III secretion of virulence factors, LPS modifications and virulence
John Mittler	Associate Professor	Population genetics and evolution of pathogenic bacteria and viruses
Steve Moseley	Professor	Adherence mechanisms of enteropathogenic E. coli
Joseph Mougous	Assistant Professor	Protein secretion, cell signaling
Jim Mullins	Professor	Evolution of HIV and AIDS vaccine development
Eugene Nester	Professor	Agrobacterium-induced plant tumorigenesis
Matt Parsek	Associate Professor	Gene expression in biofilms and quorum sensing
Lalita Ramakrishnan	Associate Professor	*Mycobacterium marinum* in zebrafish: a model for TB
Ram Samudrala	Associate Professor	Computational biology: Protein structure, interactions and activity predictions
Pradeep Singh	Associate Professor	Evolution in bacterial biofilms and biofilm control in cystic fibrosis
Evgeni Sokurenko	Associate Professor	Sheer effects on bacterial adherence and evolution of adherence factors
Beth Traxler	Associate Professor	Assembly of membrane proteins in E. coli and nanofabrication

An additional indicator of the high quality of the research in the Department is the ability of the faculty to obtain extramural funding from NIH, NSF, DOE and other agencies. In 2007, UW Microbiology ranked second only to the Microbiology Department in the Harvard Medical School in garnering NIH grant dollars. The graph below shows the total grant dollars for the past 10 years and indicates that grant funding has more than tripled since the last review in 2000.



One factor responsible for this increase has been the remarkable success of Michael Katze in obtaining extramural funding. This increase can also be attributed to the new hires in the past four years and to the high productivity of junior faculty hired in 2001. Preliminary projections for fiscal year 2009 indicate that the funding level will be approximately $5M more than that in 2008.

B. Impact of Recent Advances in the Discipline on Research

The field of microbiology has always been driven by the need to understand in fundamental terms how microorganisms relate to each other, the environment, and human disease. Today, the continued presence of infectious diseases such as AIDS and tuberculosis, and the emergence of drug-resistant viral and bacterial strains, continue to provide the impetus for much of the work in the field. Recent findings on the communal behavior of bacteria are changing the ways in which microbiologists view bacteria as infectious agents and in the environment at large. Advances in understanding the nature of the interactions and communication between bacteria and eukaryotic cells and the molecular bases for innate immunity are providing new frontiers for ongoing research as well.

Recent technical advances in the fields of molecular and computational biology have fundamentally changed how microbiologists approach their research. The genomics era has opened up countless opportunities to frame new questions and pose new approaches to long-standing problems. In addition to the human, nonhuman primate, and other eukaryotic genome sequences, complete genome sequences for over 1,100 species of bacteria and many viruses are now available. Some of our faculty have participated directly in the sequencing and annotation efforts (Nester, Harwood, Leigh, Lidstrom, Bumgarner, and Mullins) while virtually everyone else has made use of genome sequences in their research in one or more ways. Genome sequences enable

a comprehensive study of the structure, function, and regulation of all of the proteins of an organism, a field now referred to as proteomics. Similarly, the description of the sum total of an organism's metabolic potential and how it changes under different conditions is called metabolomics. The tools of proteomics and metabolomics are employed extensively in the field of microbiology today. Computational approaches are now becoming available to predict the three-dimensional structures of proteins based on amino acid sequence information predicted from genome sequences. This type of information can be extended to an understanding of protein function and protein-protein interactions. One of the leaders in the field of protein structure prediction is Ram Samudrala, an Associate Professor in the Department. DNA microarrays for comparing the expression levels of all of the genes of an organism under a variety of conditions have become an indispensable tool for the study of bacterial gene regulation. Roger Bumgarner established the Center for Expression Arrays in 2000, the first of its kind at the UW. This cost center has provided invaluable services to the entire UW research community for the past 8 years. The lab of Michael Katze combines genomics, proteomics and microarray analyses to perform a complete systems analysis of host-viral interactions which will ultimately lead to a better understanding of viral pathogenesis and provide new tools for the treatment and diagnosis of viral diseases. Beth Traxler and Evgeni Sokurenko are each developing new approaches to understanding bacterial behavior through nanotechnology. Confocal microscopy is another relatively new technique that is widely used in the field. Finally, such techniques as real-time PCR, the use of mass spectrometry in protein identification, and high through-put assays represent technical advances that are now considered routine.

In addition to many new technical advances, the funding climate for microbiological research is changing as well. Current administrative efforts are concentrated on ensuring that the faculty members in the Department have the resources and support to effectively compete for extramural research grant funding from NIH, NSF, DOE, and private foundations. In addition, efforts are ongoing to identify new funding sources and new initiatives at all levels. Michael Katze's recent successes in obtaining an NIH contract, a Life Sciences Discovery Fund (LSDF) grant, and a Research Center of Excellence (RCE) grant (Co-PI with Jay Nelson) underscore the importance of seeking funding outside the conventional NIH RO1 model of investigator-initiated science. The participation of Pete Greenberg, Brad Cookson, and Joseph Mougous in Sam Miller's RCE grant represent yet another example of the value of seeking alternative funding sources.

C. Mentoring of Junior Faculty

The transition from postdoctoral fellow to Assistant Professor can be a challenging and sometimes bewildering experience. We appreciate these difficulties and have instituted a formal mentoring program for the junior faculty that is described in detail in Appendix I. Briefly, each Assistant Professor is paired with a faculty mentor by mutual agreement between the mentor and mentee. The two meet regularly to discuss issues that may come up regarding any aspect of the professional life of the junior faculty member. In particular, the mentor is expected to provide advice regarding funding strategies, teaching, research approaches, and student mentoring as well as guidance on other academic issues.

To fully support the professional development of the faculty member, the Department Junior Faculty Mentoring Committee (Appendix I), composed of 3-5 senior faculty, meets annually with Assistant Professors. These meetings provide an opportunity to assess progress towards promotion and respond to any concerns or needs that the Assistant Professor may raise. The Mentoring Committee prepares a brief written report for the Assistant Professor with a copy to the Chair.

The Chair is also expected to provide mentoring to the Assistant Professors. Regular discussions between the Chair and the junior faculty member should focus on expectations for success and promotion, as well as feedback on overall performance in research and teaching. Any needs of the junior faculty member are also discussed at these meetings.

Given the importance of positive and productive relationships between faculty and graduate students, all Assistant Professors are provided with the guide published by the UW Graduate School called "How to Mentor Graduate Students—a Faculty Guide". First-year graduate students are provided with the companion guide "How to Obtain the Mentoring You Need—A Graduate Student Guide".

D. Barriers to Faculty Productivity

Success as a faculty member in a research university requires both excellent time-management skills and the ability to multi-task. Even with these skills, the time demands on a faculty member can, at times, be overwhelming. Recently, the School of Medicine Council on Research and Graduate Education compiled a list of administrative requirements and workshops that faculty and staff must complete in the course of the daily operations of a research laboratory. While many of these requirements are clearly necessary, there is little doubt that significant reductions in the time required for these activities can be achieved. Examples include annual requirements for training in asbestos awareness, safety in working with blood-borne pathogens (includes work with virtually any established human cell line), and the mailing procedures for infectious agents. At present, some of the regulations are difficult to enforce simply because they are so onerous. The use of more on-line training and a reduction in the required frequency for courses and workshops are two steps that could be implemented to streamline these time-intensive activities.

In the last few years, the Department of Microbiology has converted to online systems for purchasing and time sheet record-keeping (including leave approval). We have also implemented procedures to track and streamline grant submissions, and provide overall better fiscal reporting for existing grants. All of these measures improve efficiency and save time for the faculty. In addition, plans are underway to develop a Department based intranet to improve our online systems and communications. It remains a priority of the Department to continue seeking ways to relieve the administrative burden for faculty to allow more time for concentrated efforts on teaching and research.

Section VI: COLLABORATIONS AND INTERDISCIPLINARITY

Research in the Department of Microbiology laboratories is enriched through a wide variety of collaborations and interdisciplinary programs. Most important but not easily quantified, are the many scientific collaborations initiated between Department faculty and researchers on campus and at other institutions in Seattle and elsewhere. Within the School of Medicine, the most notable collaborations involve investigators in the departments of Medicine, Biochemistry, Pathology, Immunology, Pharmacology, Laboratory Medicine, Bioengineering, Pediatrics, Biological Structure, and Genome Sciences. Examples of departments outside the School where collaborators can be found include Dentistry, Nursing, Chemistry, Civil and Environmental Engineering, and Chemical Engineering. Outside the University, we benefit from interactions with scientists at the Fred Hutchinson Cancer Research Center, Children's Hospital, Seattle Biomedical Research Institute, Institute for Systems Biology, and various biotech companies. Important contacts also exist at the other WWAMI (Wyoming, Alaska, Montana, and Idaho) sites involved in medical education, Pacific Northwest National Lab (Richland), University of Iowa, Oregon Health and Science University, University of Wisconsin, University of Georgia, University of North Carolina, and the Rocky Mountain Laboratories.

The Department benefits greatly from the various combined grant initiatives that grow out of these and other collaborations. Faculty in the Department have joined forces with faculty here and elsewhere to successfully obtain support through NIH Program Project Grants, Research Centers of Excellence (RCE) Grants (Miller and Katze), foundation grants (e.g. CF Foundation-Greenberg), and the Life Sciences Discovery Fund grants (Katze). An example of an interdisciplinary initiative involving the College of Engineering is the Microscale Life Sciences Center (co-PI, Lidstrom) that is funded by the NIH Center of Excellence in Genomic Science (CEGS). Such sources of funding are particularly important at a time when resources for research are so scarce.

Interdisciplinary and collaborative efforts clearly improve our graduate and undergraduate programs by providing students with increased access to training and expertise that extends beyond their immediate laboratories. In addition, the availability of these programs substantially improves our competitive position relative to our peers at the time of graduate student recruitment. Finally, in addition to our own graduate students, most Microbiology faculty have access to graduate students in the Molecular and Cellular Biology Training Program and the Medical Scientist Training Program (M.D./Ph.D. program) and some faculty are part of the Astrobiology and Nanobiology Training Programs.

Section VII: FUTURE DIRECTIONS

A. Overview

The goals of the Department for the next few years have evolved through discussions at faculty meetings, conversations between the Chair and faculty, and meetings with the Dean (Appendix F: Strategic Planning). In the next few years, the plan is to recruit three new faculty members, with the second and third hires to be

coordinated with the move of 11 current faculty into new state-of-the-art space in the J-wing (see below for details). At the time of his appointment in October 2007, Jim Champoux agreed to serve as Chair for a term of five years. Thus, in approximately 2-3 years, the Dean will need to develop a plan for the recruitment of a new chair to ensure continuity of leadership for the Department. Space in the renovated J-wing will be available should the Dean decide to pursue an external candidate for the incoming Chair.

B. Initiatives

Michael Katze has proposed a System Biology Center for Translational Infectious Disease Research and he plans to draw upon resources from recent grants and the federal stimulus package to launch such an initiative. Besides the Departments of Microbiology and Immunology and both of our Northwest Regional Centers of Excellence (RCE's), this ambitious plan includes participants from the Washington National Primate Center, the Pacific Northwest National Laboratory, the Seattle Children's Research Institute and the UW Institute of Translational Health Sciences. On a parallel course, the School of Medicine is developing plans to have an infectious disease focus for the planned phase III construction project at South Lake Union due to open in 2013. Preliminary conversations are underway to meld these and other initiatives to create an infectious disease institute at the University of Washington with enormous local and regional importance. Consistent with our mission, the Department of Microbiology will assume a leadership role in pursuing these important initiatives.

C. Faculty Recruitment

Jim Staley retired in 2008, Gene Nester will retire in 2009, and Jimmie Lara plans to retire in 2010. These three faculty have been responsible for teaching Microm 301 as well as courses in the undergraduate major. An additional vacancy was created a year ago with the untimely death of Carleen Collins, a Professor working on the mechanisms of pathogenesis and bacterial toxins. Recent hires have already begun to fill in the teaching gaps (Pete Greenberg in Microm 435, Carrie Harwood in Microm 510, Joseph Mougous in Microm 301, and Matt Parsek in Microm 410), but a strategic recruitment plan is crucial to fulfilling the teaching mission of the Department in the long term. At the time Jim Champoux was recruited to the Chair position in October of 2007, the Dean of the School provided tenure-track lines and the resources for the planned recruitments.

During the current year, we have conducted a search for a virologist. Dr. Jason Smith emerged as the top choice and is presently in negotiations with the Chair. He did his postdoctoral work with Glen Nemerow at the Scripps Research Institute and works on the role of defensins as an arm of the antiviral innate immune response. The plan is for Jason to join the faculty as an Assistant Professor in September 2009. He would come with an NIAID/NIH Research Scholar Development Award (K22).

The next faculty search will target a more senior person (Associate or full Professor) working in the area of bacterial pathogenesis. The search will be timed to coincide with the opening of the remodeled space in the J-wing (see below). After this search, the current plan is to carry out a broadly-based recruitment at the Assistant Professor level, possibly for a person working at the interface of genomics and bacterial

ecology. As with our recent search, special attention will be paid to identifying under-represented minorities and women candidates.

D. New Department Space

Currently, Microbiology research faculty members are spread out in space at distinct sites in the Health Sciences Complex and at the South Lake Union campus (Appendix A, Chart 2). Five faculty (Greenberg, Harwood, Ramakrishnan, Miller, and Fang) are permanently located in the K-wing along with four temporary occupants (Parsek, Singh, Mougous, and Nester). Five faculty are located in the F-wing (Champoux, Lara, Moseley, Sokurenko, and Leigh), one in the AA wing (Cookson), and two in the J-wing (Lagunoff and Traxler). Finally five faculty members have labs at the Rosen site located off campus at South Lake Union (Mullins, Katze, Bumgarner, Mittler, and Samudrala).

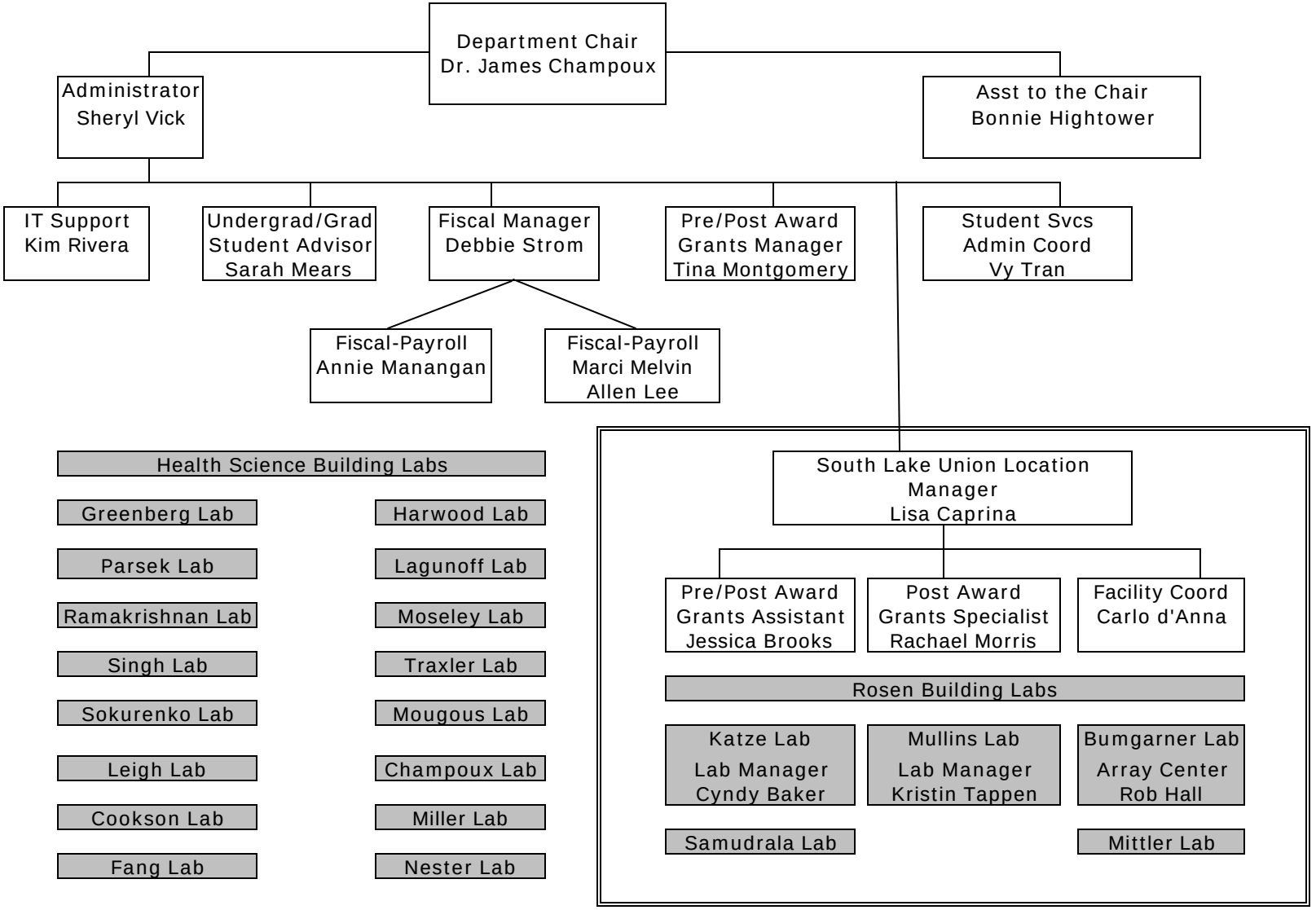
At the time Jim Champoux was appointed Chair, the University committed to providing the resources for a complete renovation of the first two floors of the J-wing for Microbiology at a total cost of $23.5M. This remodel of 32,000 ASF will enable the consolidation of Microbiology laboratories in the adjoining J and K wings of the Health Sciences Complex and include all of the primary faculty in the Department with the exception of those members at the Rosen. The design will feature faculty offices adjoining primary laboratory space on the periphery of the building to capture the natural light in the main work spaces (Appendix N). The internal laboratories will be a combination of tissue culture rooms, shared wet labs, and equipment rooms. The remodel will include new biosafety cabinets for BSL2 work, an autoclave and two cold rooms on each floor, a dark room with X-ray developer, a warm room, a conference room, and eating areas in adjoining spaces.

We are currently in the Design Development phase of the project with the construction originally planned to begin in early 2010 and occupancy to occur in early 2011. Recently, as part of the federal stimulus package, NCRR posted an RFA for proposals involving the remodel of existing laboratory spaces at sites with NIH funding. We are currently preparing an application for $15M in response to this RFA. Since NIH must approve the design and construction documents before bids can be solicited for the work, this application, if successful, will delay the project at least a few months.

E. Summary

The exciting opportunity to design new space and ultimately unite most of the faculty in adjoining spaces in the J and K wings is providing a new focus for the Department and holds great promise for sustaining our excellence in research and teaching. Combining this effort with the faculty recruitment plan and new initiatives described above in many ways defines the future of the Department and solidifies our vision for Microbiology at the University of Washington in the 21st century. There are indications that this will also generate a renewed sense of purpose and camaraderie among the faculty and students of the Department.

Department of Microbiology



Appendix A—Chart 2

Academic and Geographic Organization of the Microbiology Faculty

Main Campus Health Sciences Faculty

James Champoux*
Ed Clark (Joint with Immun. Primate Center)
Brad Cookson* (Joint with Lab. Med.)
Ferric Fang (Joint with Lab. Med.)
Pete Greenberg
Caroline Harwood
Michael Lagunoff*
Jimmie Lara
John Leigh*
Mary Lidstrom (Joint with Chem Eng., Ben Hall Building)
Samuel Miller (Joint with Med. and Genome Sci.)
Steve Moseley*
Joseph Mougous*
Eugene Nester*
Matt Parsek*
Lalita Ramakrishnan
Pradeep Singh* (Joint with Med.)
Evgeni Sokurenko*
Beth Traxler*

*Scheduled to move to J-wing in 2011

Rosen Building[1] Faculty

Roger Bumgarner
Michael Katze
John Mittler
James Mullins
Ram Samudrala

[1]At south Lake Union

T-wing Main Campus Undergraduate Teaching Faculty[2]

Denise Anderson
Mark Chandler
Janis Fulton
Kendall Gray

[2]Senior Lecturers

Other Training Faculty[3] — Location

Richard Darveau (Adj)	Health Sciences
Michael Emerman (Affil.)	FHCRC
David Fredricks (Adj.)	Health Sciences
Michael Gale (Adj.)	Health Sciences
Denise Galloway (Res Prof.)	FHCRC
Adam Geballe (Affil.)	FHCRC
Keith Jerome (Affil.)	FHCRC
Kelly Lee (Adj.)	Health Sciences
Shiu-Lok Hu (Adj.)	Western Building
Maxine Linial (Res. Prof.)	FHCRC
Julie Overbaugh (Affil.)	FHCRC
Nina Salama (Affil.)	FHCRC
David Stahl (Adj.)	Ben Hall Building

[3]In addition to the faculty on the main campus and Rosen facility, these faculty also mentor graduate students.

Department of Microbiology
Committees Assignments
2008-2009

Graduate Policy and Advising
Harwood (Chair)
Champoux
Mears

Graduate Admissions
Lagunoff (Chair)
Bumgarner
Galloway
Leigh
Parsek
Heiniger (student)
Mears

Undergraduate Curriculum & Advising
Traxler (Chair)
Anderson
Fulton
Gray
Leigh (Independent Study Advisor)
Mears

Appointments & Promotions (Adjunct and Affiliate)
Nester (Chair)
Clark
Lara
Moseley

Retreat
Mittler
Ramakrishnan
LaRock (student)

Safety
Bumgarner (Chair)
Vick (Administrator)
Chandler
Sokurenko
Icenogle (student)

Seminars
Leigh (Chair)
Greenberg
Mougous
Li (student)

Medical School Admissions
Bumgarner
Clark
Mittler
Moseley

Faculty Search
Lagunoff (Chair)
Champoux
Galloway
Geballe
Lingappa
Mullins
Katze
Marshall (student)

Junior Faculty Mentoring
Cookson (Chair)
Nester
Leigh

Medical Student Course Director
Moseley

Faculty Senate
Ramakrishnan
Mullins

Undergraduate Awards & Scholarships
Fulton (Chair)
Anderson
Chandler
Greenberg
Nester

Whiteley/Groman Awards and Annual Seminar Speakers
Nester (Chair)
Fulton
Parsek
Lara
Linial

Falkow Award
Greenberg (Chair)
Moseley

Appendix B
Budget Summary

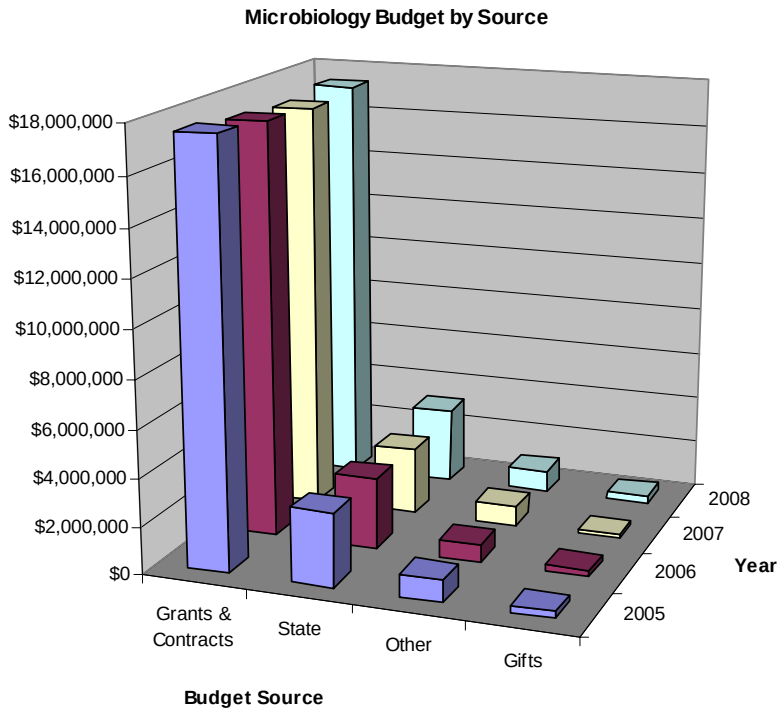


Fig. 1

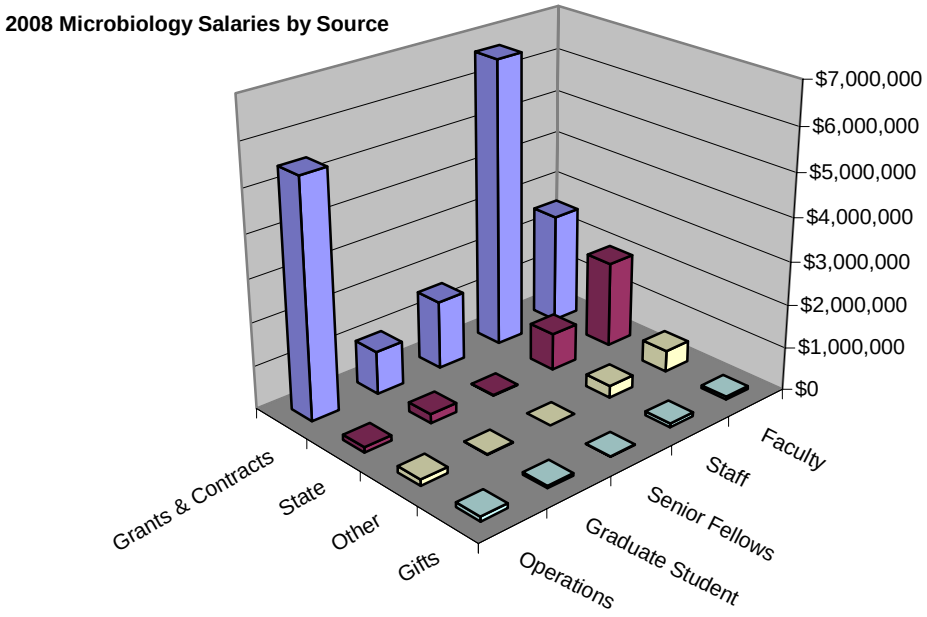


Fig. 2

Appendix C
Faculty 2008-2010

Faculty name	Rank	FTE	Microbiol. Course(s) taught 2008-2009[1]	Responsib. (approx %) 2008-2009	Planned Microbiol. teaching for 2009-2010	Responsib. (approx %) 2009-2010	Member Ph.D. thesis committees	Ph.D. thesis committees chaired
Denise Anderson	Senior Lecturer	100	Microm 301 Microm 443 Microm 444 Microm 302	(2x) 100/50 (2x) 40/60 40 (lab) 40	Microm 301 Microm 443 Microm 444 Microm 302	(2x) 100/50 (2x) 40/100 40 (lab) 40	NA	NA
Roger Bumgarner	Associate Professor	100	Conj 546	100	Conj 546	100	7	2
James Champoux	Professor and Chair	100	Microm 450	100	Microm 450	100	11	0
Mark Chandler	Senior Lecturer	100	Microm 431 Microm 302 Microm 443 Microm 482 Microm 442	100 (2x) 100/60 40 (2x) 100 8	Microm 431 Microm 302 Microm 443 Microm 482 Microm 442	100 (2x) 100/60 50 (2X) 100 8	NA	NA
Edward Clark	Professor (WOT), joint with Immunology	100					5	3
Brad Cookson[2]	Professor, joint with Laboratory Medicine	100	Microm 442 Microm 554	70 100	Microm 442 Microm 554 Microm 553	70 100 20	13	4
Ferric Fang[2]	Professor, joint with Laboratory Medicine	100	Microm 442 HuBio 534 Microm 555 Microm 529	8 3 100 100	Microm 442 HuBio 534 Microm 555 Microm 553 Microm 529	8 3 100 10 100	1	0

[1] Only major teaching responsbilities are listed. The occasional single lecture in a course is not included.
[2] In addition to indicated teaching, also has clinical responsibilites.

Janis Fulton	Senior Lecturer	100	Microm 402 Microm 443 Microm 444	100 60 60 (lab)	Microm 402 Microm 443 Microm 444	100 60 60 (lab)	NA	NA
Denise Galloway	Research Prof. FHCRC	NA	MCB 532	20			6	2
E. Peter Greenberg	Professor	100	Microm 522 Microm 510	100 5	Microm 522 Microm 435	100 50	6	1
Kendall Gray	Senior Lecturer	100	Microm 301 Microm 402 Microm 302 Microm 411 Microm 412 Microm 482	10 100 100 100 (lab) 10 100	Microm 402 Microm 302 Microm 411 Microm 412 Microm 482	100 100 100 (lab) 10 100	NA	NA
Caroline Harwood	Professor	100	Microm 510	100	Microm 553 Microm 530	10 30	11	3
Michael Katze	Professor	100			Microm 540	100	2	1
Michael Lagunoff	Associate Professor	100	Microm 445	80	Microm 445	80	13	2
Jimmie Lara	Associate Professor	100	Microm 410 Biol 200 Microm 301	35 50 50	Microm 410 Biol 200 Microm 301	35 10 50	0	0
John Leigh	Professor	100	Microm 412	100	Microm 412 Microm 530	100 60	16	0
Mary Lidstrom	Professor, joint with Chemical Engineering	100					7	2
Maxine Linial	Research Prof. FHCRC	NA	MCB 532	20			3	0
Samuel Miller[2]	Professor, joint with Medicine and Genome Sciences	100			Microm 553	5	10	5
John Mittler	Associate Professor	100	Conj 549	100	Microm 435	50	7	0

Steve Moseley	Professor	100	HuBio 534	80	HuBio 534	80	5	2
Joseph Mougous	Assistant Professor	100			Microm 301 Microm 553	50 5	3	1
James Mullins	Professor	100	Microm 445	10	Biol 200 Microm 445	40 10	5	2
Eugene Nester	Professor	100	Microm 301	100	Microm 301	50	3	0
Matthew Parsek	Associate Professor	100	Microm 410 Microm 510	35 5	Microm 410 Microm 553	40 10	6	1
Lalita Ramakrishnan[2]	Associate Professor	100	Microm 442 HuBio 534	4 3	Microm 553 HuBio534	50 3	10	2
Ram Samudrala	Associate Professor	100			Conj 548	100	16	4
Pradeep Singh[2]	Associate Professor	100			Microm 553	10	2	0
Evgeni Sokurenko	Associate Professor	100	HuBio 534 Conj 557	15 50	HuBio 534 Conj 557 Microm 553	15 50 10	3	1
Beth Traxler	Associate Professor	100	Microm 410 Microm 411 GS197	30 50 100	Microm 410 Microm 411 GS197	25 50 100	9	2

Course Descriptions (credits):

Microm 301 - General Microbiology (3)
Microm 302 - General Microbiology Laboratory (2)
Microm 402 - Fundamentals of General Microbiology Lab. (3)
Microm 410 - Fundamentals of General Microbiology I (3)
Microm 411 - Gene Action (5)
Microm 412 - Fundamentals of General Microbiology III (3)
Microm 431 - Prokaryotic Recombinant DNA Techniques (3)
Microm 435 - Microbial Ecology (3)
Microm 442 - Medical Bacteriology (3)
Microm 443 - Medical Microbiology Laboratory (3)
Microm 444 - Medical Mycology and Parasitology (4)
Microm 445 - Medical Virology (2)
Microm 450 - Molecular Biology of Viruses (3)
Microm 482 - Peer Teaching Assistants in Microbiology 1-5)
GS 197 (Traxler) - Diversity Issues in Science (1)
Microm 510 - Physiology of Bacteria (3)
Microm 522 - Current Research in Microbiology (1)
Microm 530 - Evolution of Prokaryotic Diversity (3)
Microm 553 - Molecular Mechanisms of Bacterial Pathog. (3)
Microm 554 - Seminar in Molecular and Medical Microbiology (1)
Microm 555 - Advanced Clinical Microbiology (2.5)
Conj 546 - Survey of Technologies for Molecular Biology (1.5)
Conj 548 - Modeling Proteins and Proteomes (1.5)
Conj 549 - Microbial Population Biology (1.5)
Conj 557 - Microbial Evolution and Ecology (1.5)
HuBio 534 - Microbiology and Infectious Disease (9)
MCB 532 - Human Pathogenic Viruses (3)
Biol 200 - Introductory Biology (5) (jointly taught with Biochem.)
Microm 529 - Mechanisms of Bacterial Pathogenesis

Appendix D-Office of Academic Programs Summary Data
Department of Microbiology
Undergraduate Education

Undergraduate Majors[1]	Current 2006-07		3 Year Average		10 Year Change	
	Number	*Percent of Total*	*Number*	*Percent of Total*	*Numeric Change*	*Percent Change*
Total	172		164.3		-32	-15.7%
Male	63	36.6%	62.0	37.7%	-41	-39.4%
Female	109	63.4%	102.3	62.3%	9	9.0%
African American	7	4.1%	6.0	3.7%	0	0.0%
American Indian	1	0.6%	1.0	0.6%	-1	-50.0%
Asian American/ Haw./ Pac Island	77	44.8%	75.3	45.8%	-5	-6.1%
Hispanic/Latino	7	4.1%	5.0	3.0%	2	40.0%
Caucasian	63	36.6%	57.7	35.1%	-27	-30.0%
Non-Resident Alien	8	4.7%	7.3	4.5%	5	166.7%
Not Available	9	5.2%	12.0	7.3%	-6	-40.0%

Bachelors Degrees Awarded[2]	Current 2006-07		3 Year Average		10 Year Change	
	Number	*Percent of Total*	*Number*	*Percent of Total*	*Numeric Change*	*Percent Change*
Total	52		50.3		-2	-3.7%
Male	17	32.7%	20.0	39.7%	-12	-41.4%
Female	35	67.3%	30.3	60.3%	10	40.0%
African American	0	0.0%	0.7	1.3%	-1	-100.0%
American Indian	0	0.0%	0.3	0.7%	0	--
Asian American/ Haw./ Pac Island	23	44.2%	21.3	42.4%	3	15.0%
Hispanic/Latino	2	3.8%	1.3	2.6%	1	100.0%
Caucasian	17	32.7%	18.7	37.1%	-10	-37.0%
Non-Resident Alien	5	9.6%	3.0	6.0%	3	150.0%
Not Available	5	9.6%	5.0	9.9%	2	66.7%

Student Credit Hours (SCH) by Course Level[3]	Current 2006-07		3 Year Average		10 Year Change	
	Number	*Percent of Total*	*Number*	*Percent of Total*	*Numeric Change*	*Percent Change*
Taken by Undergraduate Students						
Lower-Division Courses	200	3.5%	167	3.0%	200	--
Upper-Division Courses	5,513	96.2%	5,397	96.8%	122	2.3%
Graduate Courses	15	0.3%	10	0.2%	-27	-64.3%
Total	5,728		5,574		295	5.4%
Taken by Graduate/Professional Students						
Lower-Division Courses	0	0.0%	0	0.0%	0	--
Upper-Division Courses	109	8.1%	126	10.0%	58	113.7%
Graduate Courses	1,229	91.9%	1,129	90.0%	39	3.2%
Total	1,338		1,254		97	7.8%
Total						
Lower-Division Courses	200	2.8%	167	2.4%	200	--
Upper-Division Courses	5,622	79.6%	5,523	80.9%	180	3.3%
Graduate Courses	1,244	17.6%	1,138	16.7%	12	0.9%
Total	7,066		6,828		391	5.9%

Student Evaluations of Instructional Quality[4]	Current 2006-07	5 Year Average
Lower-Division Courses		
Upper-Division Courses	4.3	4.2
All Courses	4.3	4.2
Satisfaction of Recent Graduates with Instruction in Their Program[5]	**Survey of 2005 Graduates**	**Average from Surveys of 2001, 2003, and 2005 Graduates**
Overall Satisfaction with Program	4.3	4.3

[1]The number of unique students with one of the majors in the major abbreviation list for the program during the academic year reported. The academic year includes only Autumn, Winter, and Spring quarters. Students with a MAJOR_LEVEL=1 or a MAJOR_LEVEL=0 and CLASS ≤ 06 are classified as undergraduate students.(Data source: Planning and Budgeting database, Query "Majors7 Combine" in I:\groups\opb\OFFICE\OIS\APPS\Accountability\Program Review Data\ProgramReview.mdb)

[2]The number of unique degrees with one of the abbreviations given in the degree abbreviation list for the program during the academic year reported. For the purpose of degrees, the academic year includes Summer quarter. (Data source: Planning and Budgeting database, Query "Degrees S9 Combine" in I:\groups\opb\OFFICE\OIS\APPS\Accountability\Program Review Data\ProgramReview.mdb)

[3]The SCH figures reported here represent the student credit hours taught in courses where the responsible curriculum is listed in the curriculum abbreviation list for the program, as of the tenth day of the quarter. Student credit hours for a program are summed over the Autumn, Winter, and Spring quarters in an academic year. Lower-division courses are those with course numbers from 100 to 299, upper-division courses are those with course numbers from 300 to 499, and graduate courses are those with course numbers 500 and above. Students are classified as undergraduates if their class code in the relevant quarter is 01 through 06, and they are identified as graduate or professional students if their class code is 08 or above. (Data source: Planning and Budgeting database, query "SCH s7 Final" in I:\groups\opb\OFFICE\OIS\APPS\Accountability\Program Review Data\ProgramReview.mdb)

[4]The student evaluations of courses represent a combination of the first four items on course evaluation forms. Possible scores range from 0 through 5. These combined scores are obtained from the five-year summaries posted every fall at: https://www.washington.edu/oea/services/course_eval/uw_seattle/five_year/index.html

[5]The measure of students' overall satisfaction with a program comes from a question about the quality of instruction in a student's major from the survey of "University of Washington Graduates One Year After Graduation", which is conducted every two years and posted at http://www.washington.edu/oea/reports/student_alumni_surveys.html. The possible scores range from 1 through 5.

Appendix D-Office of Academic Programs Summary Data
Department of Microbiology
Graduate Education - Master's Level

Master's Level Students in Program[1]	Current (2006-07)		3 Year Average		10 Year Change	
	Number	*Percent of Total*	*Number*	*Percent of Total*	*Numeric Change*	*Percent Change*
Total	1		3.3		-2	-66.7%
Male	0	0.0%	0.0	0.0%	-1	-100.0%
Female	1	100.0%	3.3	100.0%	-1	-50.0%
African American	0	0.0%	0.0	0.0%	0	0.0%
American Indian	0	0.0%	0.0	0.0%	0	0.0%
Asian American/ Haw./ Pac Island	1	100.0%	1.0	30.0%	0	0.0%
Hispanic/Latino	0	0.0%	0.0	0.0%	0	0.0%
Caucasian	0	0.0%	2.0	60.0%	-2	-100.0%
Non-Resident Alien	0	0.0%	0.3	10.0%	0	0.0%
Not Available	0	0.0%	0.0	0.0%	0	0.0%

Master's Degrees Awarded[2]	Current (2006-07)		3 Year Average		10 Year Change	
	Number	*Percent of Total*	*Number*	*Percent of Total*	*Numeric Change*	*Percent Change*
Total	1		0.7		0	0.0%
Male	0	0.0%	0.3	50.0%	-1	-100.0%
Female	1	100.0%	0.3	50.0%	1	0.0%
African American	0	0.0%	0.0	0.0%	0	0.0%
American Indian	0	0.0%	0.0	0.0%	0	0.0%
Asian American/ Haw./ Pac Island	0	0.0%	0.0	0.0%	0	0.0%
Hispanic/Latino	0	0.0%	0.0	0.0%	0	0.0%
Caucasian	1	100.0%	0.7	100.0%	0	0.0%
Non-Resident Alien	0	0.0%	0.0	0.0%	0	0.0%
Not Available	0	0.0%	0.0	0.0%	0	0.0%

Master's Student Admissions[3]	Current (2006-07)	3 Year Average	10 Year Change	
			Numeric Change	*Percent Change*
Number Applied	0	0	-3	-100.0%
Number Accepted	0	0	-1	-100.0%
Number Enrolled	0	0	-1	-100.0%
Percentage of Applicants Accepted	--	--		
Percentage of Accepted Enrolling	--	--		

Master's Student Progress/ Satisfaction[4]	Current (2006-07)	3 Year Average	10 Year Change
# Survey Respondents	1	1	0
Placement Rate at Time of Degree Award	0.0%	0.0%	0.0%
Percentage of Students Who Published During Graduate Study	0.0%	0.0%	0.0%
Overall Satisfaction with program (Exit Survey)	4.0	4.0	1.0

[1]The number of unique students with one of the majors in the major abbreviation list for the program during the academic year reported. The academic year includes only Autumn, Winter, and Spring quarters. Students with a MAJOR_LEVEL=2 are classified as Master's students. (Data source: Planning and Budgeting database, Query "Majors7 Combine" in I:\groups\opb\OFFICE\OIS\APPS\Accountability\Program Review Data\ProgramReview.mdb).

[2]The number of unique degrees, with DEGREE_LEVEL=2, with one of the abbreviations given in the degree abbreviation list for the program during the academic year reported. For the purpose of degrees, the academic year includes Summer quarter. (Data source: Planning and Budgeting database, Query "Degrees S9 Combine" in I:\groups\opb\OFFICE\OIS\APPS\Accountability\Program Review Data\ProgramReview.mdb)

[3]The number of master's program applicants is obtained by choosing unique applicants with an application type of "G", a degree_lvl_goal of 2, and an application status of 1, 4, 5, 8, 12, 14, 16, or 24. The number of accepted students is obtained by counting the subset of applicants who have an application status of 12, 14, 16, or 24. The number of enrolled is obtained by counting the subset of applicants who have an application status of 12. (Data source: APPL_HISTORY database, Query "Application Yield S4 Sort" in I:\groups\opb\OFFICE\OIS\APPS\Accountability\Program Review Data\ProgramReview.mdb)

[4]These measures come from the Graduate School Exit Questionnaire, which is administered to graduating master's and doctoral students at the time they apply for the degree. A sample questionnaire and University summary reports are also available at http://www.grad.washington.edu/stats/exitsurv/index.htm.

Appendix D-Office of Academic Programs Summary Data
Department of Microbiology
Graduate Education - Doctoral Level

Doctoral Level Students in Program[1]	Current (2006-07)		3 Year Average		10 Year Change	
	Number	*Percent of Total*	*Number*	*Percent of Total*	*Numeric Change*	*Percent Change*
Total	51		42.7		10	24.4%
Male	20	39.2%	19.0	44.5%	-4	-16.7%
Female	31	60.8%	23.7	55.5%	14	82.4%
African American	0	0.0%	0.0	0.0%	0	0.0%
American Indian	0	0.0%	0.0	0.0%	0	0.0%
Asian American/ Haw./ Pac Island	1	2.0%	1.0	2.3%	-1	-50.0%
Hispanic/Latino	2	3.9%	2.0	4.7%	0	0.0%
Caucasian	33	64.7%	27.7	64.8%	2	6.5%
Non-Resident Alien	11	21.6%	9.0	21.1%	5	83.3%
Not Available	4	7.8%	3.0	7.0%	4	0.0%

Doctoral Degrees Awarded[2]	Current (2006-07)		3 Year Average		10 Year Change	
	Number	*Percent of Total*	*Number*	*Percent of Total*	*Numeric Change*	*Percent Change*
Total	5		3.0		1	25.0%
Male	5	100.0%	2.0	66.7%	3	150.0%
Female	0	0.0%	1.0	33.3%	-2	-100.0%
African American	0	0.0%	0.0	0.0%	0	0.0%
American Indian	0	0.0%	0.0	0.0%	0	0.0%
Asian American/ Haw./ Pac Island	0	0.0%	0.0	0.0%	0	0.0%
Hispanic/Latino	0	0.0%	0.3	11.1%	0	0.0%
Caucasian	3	60.0%	1.7	55.6%	-1	-25.0%
Non-Resident Alien	2	40.0%	1.0	33.3%	2	0.0%
Not Available	0	0.0%	0.0	0.0%	0	0.0%

Doctoral Student Admissions[3]	Current (2006-07)	3 Year Average	10 Year Change	
			Numeric Change	*Percent Change*
Number Applied	124	113	20	19.2%
Number Accepted	24	25	19	380.0%
Number Enrolled	6	7	1	20.0%
Percentage of Applicants Accepted	19.4%	22.2%		
Percentage of Accepted Enrolling	25.0%	28.0%		

Doctoral Student Progress/ Satisfaction[4]	Current (2006-07)	3 Year Average	10 Year Change
# Survey Respondents	4	3	1
Placement Rate at Time of Degree Award	75.0%	66.7%	-25.0%
Percentage of Students Who Published During Graduate Study	100.0%	100.0%	0.0%
Overall Satisfaction with program (Exit Survey)	4.0	4.2	0.7

[1]The number of unique students with one of the majors in the major abbreviation list for the program during the academic year reported. The academic year includes only Autumn, Winter, and Spring quarters. Students with a MAJOR_LEVEL=3 or MAJOR_LEVEL=4 are classified as Doctoral students. (Data source: Planning and Budgeting database, Query "Majors7 Combine" in I:\groups\opb\OFFICE\OIS\APPS\Accountability\Program Review Data\ProgramReview.mdb).

[2]The number of unique degrees, with DEGREE_LEVEL=4, with one of the abbreviations given in the degree abbreviation list for the program during the academic year reported. For the purpose of degrees, the academic year includes Summer quarter. (Data source: Planning and Budgeting database, Query "Degrees S9 Combine" in I:\groups\opb\OFFICE\OIS\APPS\Accountability\Program Review Data\ProgramReview.mdb)

[3]The number of doctoral applicants is obtained by choosing unique applicants with an application type of "G", a degree_lvl_goal of 3 or 4, and an application status of 1, 4, 5, 8, 12, 14, 16, or 24. The number of accepted students is obtained by counting the subset of applicants who have an application status of 12, 14, 16, or 24. The number of enrolled is obtained by counting the subset of applicants who have an application status of 12. (Data source: APPL_HISTORY database, Query "Application Yield S4 Sort" in I:\groups\opb\OFFICE\OIS\APPS\Accountability\Program Review Data\ProgramReview.mdb)

[4]These measures come from the Graduate School Exit Questionnaire, which is administered to graduating master's and doctoral students at the time they apply for the degree. A sample questionnaire and University summary reports are also available at http://www.grad.washington.edu/stats/exitsurv/index.htm.

APPENDIX E

Microbiology Faculty Biosketches

Bumgarner, Roger	Associate Professor
Champoux, James	Professor and Chair
Clark, Ed	Professor
Cookson, Brad	Associate Professor
Fang, Ferric	Professor
Greenberg, E.P.	Professor
Harwood, Caroline	Professor
Katze, Michael	Professor
Lagunoff, Michael	Associate Professor
Lara, Jim	Associate Professor
Leigh, John	Professor
Lidstrom, Mary	Professor
Miller, Samuel	Professor
Mittler, John	Associate Professor
Moseley, Stephen	Professor
Mougous, Joseph	Assistant Professor
Mullins, James	Professor
Nester, Eugene	Professor
Parsek, Matthew	Associate Professor
Ramakrishnan, Lalita	Associate Professor
Samudrala, Ram	Associate Professor
Singh, Pradeep	Associate Professor
Sokurenko, Evgeni	Associate Professor
Traxler, Beth	Associate Professor

BIOGRAPHICAL SKETCH

NAME	POSITION TITLE
Bumgarner, Roger E.	Associate Professor
eRA COMMONS USER NAME rogerbumgarner	

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	YEAR(s)	FIELD OF STUDY
Elgin Community College	A.S	1978- 1980	Chemistry
Eastern Illinois University	B.S.	1980 – 1982	Chemistry
Eastern Illinois University	M.S.	1982 – 1984	Chemistry
University of Arizona	Ph.D.	1984 – 1988	Chemistry
California Institute of Technology	Fellow	1988 – 1991	Geology/Planetary Sci
California Institute of Technology	Fellow	1991 - 1992	Biology

A. POSITIONS AND HONORS

Positions and Employment

9/82–12/83 Teaching Assistant, Dept of Chemistry, Eastern Illinois University
1/83-8/85 Teaching Assistant, Dept of Chemistry, University of Arizona.
8/85-8/87 Research Fellow, Dept of Chemistry, University of Arizona.
8/87-8/88 Carl S. Marvel Fellow, Dept of Chemistry, University of Arizona.
8/88-8/90 Bantrell Fellow, Div of Geology and Planetary Sciences, California Institute of Technology.
8/90-9/91 Research Fellow, Div of Geology and Planetary Sciences, California Institute of Technology.
9/91-6/92 Senior Research Fellow, Div of Biology, California Institute of Technology.
7/92-7/95 Acting Assistant Professor, Dept of Molecular Biotechnology, Univ of Washington, Seattle.
7/95-4/98 Research Scientist, Dept of Molecular Biotechnology, Univ of Washington, Seattle.
4/98-7/02 Research Assistant Professor, Dept of Microbiology, Univ of Washington, Seattle.
7/02-7/04 Assistant Professor, Dept of Microbiology, Univ of Washington, Seattle.
7/04- Associate Professor, Dept of Microbiology, Univ of Washington, Seattle.

Honors and Awards

1987 Carl S. Marvel Fellowship, Department of Chemistry, University of Arizona.
1988 Bantrell Fellow, Division of Geology and Planetary Sciences, California Institute of Technology.
1995 Distinguished Alumnus Award, Elgin Community College, Elgin Illinois.
2005 Outstanding Graduate Alumnus Award, Eastern Illinois University

B. SELECTED PEER-REVIEWED PUBLICATIONS

Geiss GK, Salvatore M, Tumpey TM, Carter VS, Wang X, Basler CF, Taubenberger JK, **Bumgarner RE**, Palese P, Katze MG, Garcia-Sastre A. Cellular transcriptional profiling in influenza A virus-infected lung epithelial cells: the role of the nonstructural NS1 protein in the evasion of the host innate defense and its potential contribution to pandemic influenza. *Proc Natl Acad Sci U S A,* 99(16): p. 10736-41(2002). [98 citations]

Park IK, He Y, Lin F, Laerum OD, Tian Q, **Bumgarner RE**, Klug CA, Li K, Kuhr C, Doyle MJ, Xie T, Schummer M, Sun Y, Goldsmith A, Clarke MF, Weissman IL, Hood L, Li L. Differential gene expression profiling of adult murine hematopoietic stem cells. *Blood* 99(2): p. 488-98(2002). [88 citations]

Yeung KY, Medvedovic M, **Bumgarner RE**. Clustering gene-expression data with repeated measurements. *Genome Biol,* 4(5): p. R34 (2003). [43 citations]

Smith MW, Yue ZN, Geiss GK, Sadovnikova NY, Carter VS, Boix L, Lazaro CA, Rosenberg GA, **Bumgarner RE**, Fausto N, Bruix J, Katze MG. Identification of novel tumor markers in hepatitis C virus-associated hepatocellular carcinoma. *Cancer Res*, 63(4): p. 859-64(2003). [75 citations].

van 't Wout AB, Lehrman GK, Mikheeva SA, O'Keeffe GC, Katze MG, **Bumgarner RE**, Geiss GK, Mullins JI. Cellular gene expression upon human immunodeficiency virus type 1 infection of CD4(+)-T-cell lines. *J Virol*, 77(2): p. 1392-402(2003) [78 citations]

Medvedovic M, Yeung KY, **Bumgarner RE**. Bayesian mixture model based clustering of replicated microarray data. *Bioinformatics,* 20(8): p. 1222-32(2004). [41 citations]

Wei C, Li J, **Bumgarner RE.** Sample size for detecting differentially expressed genes in microarray experiments. *BMC Genomics*, 5(1): p. 87(2004). [31 citations]

Yeung KY, Medvedovic M, **Bumgarner RE**. From co-expression to co-regulation: how many microarray experiments do we need? *Genome Biol*,. 5(7): p. R48(2004). [28 citations]

Bammler T, Beyer RP, Bhattacharya S, Boorman GA, Boyles A, Bradford BU, **Bumgarner RE**, et al, Zarbl H. Standardizing global gene expression analysis between laboratories and across platforms. *Nat Methods*, 2(5): p. 351-6 (2005). [186 citations]

Yeung KY, **Bumgarner RE**, Raftery AE. Bayesian model averaging: development of an improved multi-class, gene selection and classification tool for microarray data. *Bioinformatics* 21(10): p. 2394-402(2005). [33 citations]

Li Jianging, Pritchard D.K., Wang X, Park D.R., **Bumgarner R.E**., Schwartz S.M, Liles W.C. cDNA Microarray Analysis Reveals Fundamental Differences in the Expression Profiles of Primary Human Monocytes, Monocyte-Derived Macrophages, and Alveolar Macrophages, J. Leukoc Biol. 81(1):328-35(2007) [6 citations]

Chen C, Coats SR, **Bumgarner RE**, Darveau RP. Hierarchical gene expression profiles of HUVEC stimulated by different lipid A structures obtained from Porphyromonas gingivalis and Escherichia coli. Cellular Microbiology 9(4), 1028–1038(2007).

Rhesus Macaque Genome Sequencing and Analysis Consortium; Gibbs RA, Rogers J, Katze MG, **Bumgarner R**, Weinstock GM, Mardis ER, Remington KA, Strausberg RL, Venter JC, Wilson RK, et. al., Evolutionary and biomedical insights from the rhesus macaque genome Science. 316(5822):222-34(2007). [142 citations]

Ren X, Zhang X, Kim AS, Mikheev AM, Fang M, Sullivan R, **Bumgarner R**, Zarbl H., Comparative Genomics of Susceptibility to Mammary Carcinogenesis among Inbred Rat Strains: Role of Reduced Prolactin Signaling in Resistance of the Copenhagen Strain. Carcinogenesis 29(1):177-85 (2008).

Peng T, Zhu J, Hwangbo Y, Corey L, **Bumgarner RE**., Independent and cooperative antiviral actions of interferon beta and interferon gamma against Herpes Simplex Virus replication in primary human fibroblasts. J. Virology 82(4):1934-45(2008).

Geiss GK, **Bumgarner RE**, Birditt B, Dahl T, Doweidar N, Dunaway DL, Fell HP, Ferree S, George RD, Grogan T, James JJ, Maysuria M, Mitton JD, Oliveri P, Osborn JL, Peng T, Ratcliffe AL, Webster PJ, Davidson EH, Hood L. Direct multiplexed measurement of gene expression with color-coded probe pairs. Nat Biotechnology 26(3): p. 317-25(2008). [8 citations]

Deutsch EW, Ball CA, Berman JJ, Bova GS, Brazma A, **Bumgarner RE**, Campbell D, Causton HC, Christiansen J, Dauga D, Davidson DR, Gimenez G, Goo YA, Grimmond S, Henrich T, Herrmann BG, Johnson MH, Korb M, Mills JC, Oudes AJ, Parkinson HE, Pascal LE, Pollet N, Quackenbush J, Ramialison M, Ringwald M, Salgado D, Sansone SA, Sherlock G, Stoeckert, CJ, Swedlow J, Taylor RC, Walashek L, Warford A, Wilkinson DG, Zhou Y, Zon LI, Liu AY, True LD, Minimum Information Specification For In Situ Hybridization and Immunohistochemistry Experiments (MISFISHIE), Nature Biotechnology, 26(3):305-12(2008).[6 citations]

Zhu J, Zhang B, Smith EN, Drees B, Brem RB, Kruglyak L, **Bumgarner RE**, Schadt EE, Integrating Large-Scale Functional Genomic Data to Dissect the Complexity of Yeast Regulatory Networks, Nat Genet. Jul;40(7):854-61(2008).

Chang D., Hayashi S., Gharib S., Vaisar T., King S.T., Tsuchiya M., Ruzinski J., Park D., Matute-Bello G., Wurfel M., **Bumgarner R.E**., Heinecke J., Martin T., Proteomic and Computational Analysis of Bronchoalveolar Proteins During the Course of ARDS. Am J Respir Crit Care Med. 2008 Jul 24. (Epub ahead of print).

Chu V. T., Gottardo R., Raftery A.E., **Bumgarner R.E.** and Yeung K.Y., MeV+R: Using MEV as a GUI for Bioconductor Applications in Microarray Analysis. Genome Biol. 24;9(7):R118(2008).

BIOGRAPHICAL SKETCH

NAME Champoux, James J.	POSITION TITLE Professor
eRA COMMONS USER NAME champoux	

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	YEAR(s)	FIELD OF STUDY
University of Washington, Seattle, WA	B.S.	1965	Chemistry
Stanford University, Stanford, CA	Ph.D.	1970	Biochemistry
The Salk Institute, San Diego, CA	Postdoc	1970-72	Tumor Viruses

A. Positions and Honors.

Faculty Positions Held:

1972-78 Assistant Professor, Dept. of Microbiology and Immunology, Univ. of Washington, Seattle, WA
1978-82 Associate Professor, Dept. of Microbiology and Immunology, University of Washington
2002-2004 Interim Chair, Dept. of Microbiology, University of Washington
1982-present Professor, Dept. of Microbiology, University of Washington
2007-present Chair, Department of Microbiology, University of Washington

Professional Responsibilities:

1979-84 Member Advisory Committee on Nucleic Acids and Protein Synthesis, (Study section for research grant applications), American Cancer Society
1994 Member of AIDS Study Section, NIH
1998 Member of Biochemistry Study Section, NIH

Awards:

1964 Phi Beta Kappa
1980-81 Recipient of Guggenheim Fellowship for sabbatical leave studies (with Dr. D. Baltimore, M.I.T.)
1985 Recipient of Distinguished Teaching Award, University of Washington
2005 Fellow, American Academy of Microbiology

B. Selected peer-reviewed publications (in chronological order).

Interthal, H., Pouliot, J. J. and Champoux, J. J. (2001). The Tyrosyl-DNA Phosphodiesterase Tdp1 is a Member of the Phospholipase D Superfamily. Proc. Natl. Acad. Sci. USA **98:**12009-12014.

Davies, D. R., Interthal, H., Champoux, J. J., and Hol, W. G. J. (2002). The Crystal Structure of Human Tyrosyl-DNA Phosphodiesterase, Tdp1. Structure **10:**237-248.

Champoux, J. J. (2002). A First View of the Structure of a Type IA Topoisomerase with Bound DNA. Trends in Pharmacol. Sci. **23:**199-201.

Yang, Z. and Champoux, J. J. (2002). Reconstitution of Enzymatic Activity by the Association of the Cap and Catalytic Domains of Human Topoisomerase I. J. Biol. Chem. **277:**30815-30823.

Champoux, J. J. (2002). Commentary—Type IA DNA Topoisomerases: Strictly One Step at a Time. Proc. Natl. Acad. Sci. USA **99:**11998-2000.

Davies, D. R., Interthal, H., Champoux, J. J. and Hol, W. G. J. (2002). Insights into Substrate Binding and Catalytic Mechanism of Human Tyrosyl DNA Phosphodiesterase (Tdp1) from Vanadate- and Tungstate-Inhibited Structures. J. Mol. Biol. **324:**917-932.

Schultz, S. J., Zhang, M. and Champoux, J. J. (2003). Specific Cleavages by RNase H Facilitate Initiation of Plus-Strand RNA Synthesis by Moloney Murine Leukemia Virus. J. Virol. **77:**5275-5285.

Carey, J. F., Schultz, S. J., Sisson, L., Fazzio, T. G. and Champoux, J. J. (2003). DNA Relaxation by Human Topoisomerase I Occurs in the Closed Clamp Conformation of the Protein. Proc. Natl. Acad. Sci. USA. **100:**5640-5645.

Davies, D. R., Interthal, H., Champoux, J. J. and Hol, W. G. J. (2003). Crystal Structure of a Transition State Mimic for Tyrosyl-DNA Phosphodiesterase (Tdp1) Assembled From Vanadate, DNA and a Topoisomerase I-Derived Peptide. Chemistry and Biology **10:**139-147.

Roy, R., Trowbridge, P., Yang, Z., Champoux, J. J. and Simmons, D. T. (2003). The Cap Region of Topoisomerase I Binds to Sites near Both Ends of Simian Virus 40 T Antigen. J. Virol. **77:**9809-9816.

Interthal, H., Quigley, P. M., Hol, W.G. J., and Champoux, J. J. (2004). The Role of Lysine 532 in the Catalytic Mechanism of Human Topoisomerase I. J. Biol. Chem. **279:**2984-2992.

Davies, D. R., Interthal, H., Champoux, J. J., and Hol, W. G. J. (2004). Explorations of Peptide and Oligonucleotide Binding Sites of Tyrosyl-DNA Phosphodiesterase (Tdp1) Using Vanadate Complexes. J. Med. Chem. **47:**829-837.

Champoux, J. J. (2004). DNA Topoisomerases: Type I. In Encyclopedia of Biological Chemistry, (W. J. Lennarz and M.D. Lane, eds.). Elsevier, Oxford, Vol. 1, pp. 798-805.

Schultz, S. J., Zhang, M. and Champoux, J. J. (2004). Recognition of Internal Cleavage Sites by Retroviral RNases H. J. Mol. Biol. **344:**635-652.

Winshell, J., Paulson, B. A., Buelow, B. D. and Champoux, J. J. (2004). Requirements for DNA Unpairing during Displacement Synthesis by HIV-1 Reverse Transcriptase. J. Biol. Chem. **279:**52924-52933.

Interthal, H., Chen, H. J., Kehl-Fie, T. E., Zotzmann, J., Leppard, J. B. and Champoux, J. J. (2005). SCAN1 Mutant Tdp1 Accumulates the Enzyme-DNA Intermediate and Causes Camptothecin Hypersensitivity. EMBO J. **24:**2224-2233.

Leppard, J. B. and Champoux J. J. (2005). Human DNA Topoisomerase I: Relaxation, Roles, and Damage Control. Chromosoma, **114:**75-85.

Interthal, H., Chen, H. J. and Champoux, J. J. (2005). Human Tdp1 Cleaves a Broad Spectrum of Substrates, Including Phosphoamide Linkages. J. Biol. Chem. **280:**36518-36528.

Schultz, S. J., Zhang, M. and Champoux, J. J. (2006). Sequence, Distance, and Accessibility are Determinants of 5' End-Directed Cleavages by Retroviral RNases H. J. Biol. Chem. **281:**1943-1955.

Lanciault, C. and Champoux, J. J. (2006). Pausing During Reverse Transcription Increases Rate of Retroviral Recombination. J. Virol. **80:** 2483-2494.

Davies, D. R., Mushtaq, A., Interthal, H., Champoux J. J. and Hol, W. G. J. (2006). The Structure of the Transition State of the Heterodimeric Topoisomerase I of *Leishmania donovani* as a Vanadate Complex With Nicked DNA. J. Mol. Biol. **357:**1202-1210.

Paulson, B. A., Zhang, M., Schultz, S. J. and Champoux, J. J. (2007). Substitution of Alanine for Tyrosine-64 in the Fingers Subdomain of M-MuLV Reverse Transcriptase Impairs Strand Displacement Synthesis and Blocks Viral Replication *In Vivo*. Virology **366:**361-376.

Hirano, R., Interthal, H., Huang, C., Nakamura, T., Deguchi, K., Choi, K., Bhattacharjee, M. B., Arimura, K., Umehara, F., Izumo, S., Northrop, J. L., Salih, M. A. M., Inoue, K., Armstrong, D. L., Champoux, J. J., Takashima, H. and Boerkoel, C.F. (2007). Spinocerebellar Ataxia with Axonal Neuropathy: Consequence of a Tdp1 Recessive Neomorphic Mutation? EMBO J. **26:**4732-4743.

Schultz, S. J., and Champoux, J. J. (2008). RNase H Activity: Structure, Specificity, and Function in Reverse Transcription. Virus Research, **134:**86-103.

Hyeongnam K., Cardellina II, J. H., Akee, R., Champoux, J J., and Stivers, J.T. (2008). Arylstibonic acids: Novel Inhibitors and Activators of Human Topoisomerase IB. Bioorg. Chem. **36:**190-197.

Champoux, J. J. and Schultz, S. J. (2009). Ribonuclease H: Properties, Substrate Specificity, and Roles in Retroviral Reverse Transcription. FEBS Journal (In press).

BIOGRAPHICAL SKETCH

NAME	POSITION TITLE
Clark, Edward A.	Professor
eRA COMMONS USER NAME eclark	

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	YEAR(s)	FIELD OF STUDY
University of California, Los Angeles	B.A.	1969	Psychology/Zoology
University of California, Los Angeles	Ph.D.	1977	Microbiology/Immunolog

A. Positions and Honors.

Positions Held

1990-**present**, Professor, Microbiology, UW (1984-90, Assoc. Professor)
2001-**present**, Professor, Immunology, UW (1991-2001**,** Adj. Professor, 1984-90, Adj. Assoc. Professor)
1979-**present**, Core Staff Scientist, Washington Regional Primate Research Center; 1996-2007, Division Head (Hematologic Resources), Primate Center, UW
2001-**present**, Founder and Chair, Scientific Advisory Board, Trubion Pharmaceuticals, Inc. (TRBN)
1989-2007 Member, Center for AIDS Research, UW; 1989-1998, Program Director, Lymphocyte Activation Group, UW; 1981-84, Founding and Senior Scientist, Genetic Systems Corporation, Seattle; 1979-84, Asst. Professor, Genetics, University of Washington (UW); 1977-79, Honorary Staff Res. Asst. Zoology, University College, London (with N.A. Mitchison); 1973-77, Postgraduate Res. Asst., Microbiology and Immunology, UCLA (with W.H. Hildemann); 1970-73, Staff Research Associate and Renal Transplant Coordinator, Surgery, UCLA; 1968-69, Research Assistant, Department of Surgery, UCLA (with P.I. Terasaki).

National Panels and Editing

1988-1993, Ed. Board, *Journal of Clinical Immunology*; 1990-1994, Member, NIH Exper. Immunol. Study Section; 1990-2004, Advisory Board, *Tissue Antigens;* 1992-1995, Section Editor (Assigning), *Journal of Immunology;* 1996-2001 Deputy Editor (Assigning), *Cellular Immunology*; 1996-2001, Member, American Cancer Society Cancer Immunology Review Panel (Chairman, 1999-2001); 1999-**present**, Ed. Board, *Human Immunology*; 2001-2004, Transmitting Editor, *International Immunology*.

Honors

University of California Regents Scholar, 1965-1969; Inter-Science Research Foundation Graduate Student Research Prize, 1977; Edna A. Old Memorial Fellow, Cancer Research Institute of New York, 1977-1979; Japanese Ministry of Education (Mombusho) Foreign Research Scholar, Osaka University, 1987; Science Watch, Highly Cited Authors in Immunology 1990-94 (May 1995); 1981-2001, (November 2001); NIAID MERIT award, July 2004-**present**.

B. Selected publications.

- Niiro H, Clark EA (2002) Regulation of B cell fate by antigen receptor signals. *Nat Rev Immunol*, 2:945-956. PMID: 12461567
- Sidorenko SP, Clark EA (2003) The dual function CD150 receptor family: the viral attraction, *Nat Immunol*, 4: 19-24. MID: 12496974
- Craxton A, Magaletti D, Ryan EJ, Clark EA. (2003) Macrophage- and dendritic cell-dependent regulation of human B-cell proliferation requires the TNF family ligand BAFF. *Blood* 101:4464-4471. PMID: 12531790
- Olson NE, Graves JD, Shu GL, Ryan EJ. Clark EA. (2003) Caspase activity is required for stimulated B lymphocytes to enter the cell cycle. *J Immunol* 170:6065-6072. PMID: 12794135
- Giordano D, Magaletti DM, Clark EA, Beavo JA. (2003). Cyclic nucleotides promote monocyte differentiation towards a DC-SIGN (CD209)+ intermediate cell and impair differentiation into dendritic cells, *J Immunol* 171:6421-6430. PMID: 14662841

- Niiro H, Clark EA. (2003). Branches of the B cell antigen receptor pathway are directed by protein conduits Bam32 and Carma1, *Immunity* 19: 637-640. PMID: 14614850
- Graves JD, Craxton A., Clark EA. (2004). Modulation and function of caspase pathways in B lymphocytes, *Immunol Rev*, 197:129-146. PMID: 14962192
- Bengtsson AK, Ryan EJ, Giordano D, Magaletti DM, Clark EA. (2004). 17-{beta}-estradiol (E2) modulates cytokine and chemokine expression in human monocyte-derived. dendritic cells *Blood* 104:1404-1410. PMID: 15142882
- Yankee TM, Yun TJ, Draves KE, Ganesh K, Bevan MJ, Kaja MK, Clark EA. (2004). The Gads/GrpL adaptor protein regulated T cell homeostasis, *J Immunol* 173:1711-1720. MID: 15265900
- Allam A, Niiro H, Clark EA, Marshall AJ. (2004). The adaptor protein Bam32 regulates Rac1 activation and actin remodeling through a phosphorylation-dependent mechanism, *J Biol Chem.*, 279:39775-82. PMID: 15247305
- Niiro H, Allam A, Stoddart A, Brodsky FM, Marshall AJ, Clark EA. (2004). The B lymphocyte adaptor molecule of 32 kilodaltons (Bam32) regulates B cell antigen receptor internalization, *J Immunol*, 173:5601-5609. PMID: 15494510
- Yankee TM, Draves KD, Clark EA. (2005). Expression and function of the adaptor protein Gads in murine B cells, *Europ J Immunol*, 35:1184-1192. PMID: 15761845
- Clark EA, Ledbetter JA. (2005). How does B cell depletion therapy work, and how can it be improved? *Ann Rheum Dis* 64(Suppl 4):77-80. PMID: 16239394
- Craxton A, Draves KE, Gruppi A, Clark EA. (2005). BAFF regulates B cell survival by downregulating the BH3-only family member Bim via the ERK pathway. *J Exp Med* 202:1363-1374. PMCID: 2212971
- Chen CH, Floyd H, Olson NE, Magaletti D, Li C, Draves K, Clark EA. (2006). Dendritic-cell-associated C-type lectin 2 (DCAL-2) alters dendritic-cell maturation and cytokine production. *Blood* 107:1459-1467. PMCID: 1895401
- Giordano D, Magaletti DM, Clark EA. (2006). Nitric oxide and cGMP protein kinase (cGK) regulate dendritic-cell migration toward the lymph-node-directing chemokine CCL19. *Blood* 107:1537-1545. PMCID:1895400
- Acosta-Rodriguez EV, Craxton A, Hendricks DW, Merino MC, Montes CL, Clark EA, Gruppi A. (2007). BAFF and LPS cooperate to induce B cells to become susceptible to CD95/Fas-mediated cell death, *Europ J. Immunol*. 37:990-1000. PMID: 17357108
- Craxton A, Draves KE, Clark EA. (2007). Bim promotes BCR-induced entry of B cells into the cell cycle, *Europ J Immunol*, 37:2715-2722. PMID: 17705137
- Hughes GC, Clark EA (2007). Regulation of dendritic cells by female sex steroids: Relevance to immunity and autoimmunity. *Autoimmunity*. 40:470-81. PMID: 17729041
- Baskin CR, Bielefeldt-Ohmann H, Garcia-Sastre A, Tumpey TM, van Hoeven N, Billharz R, Fornek JL, Carter VS, Thomas MJ, Solorzano A, Chen CK, Clark EA, Kaja MK, Katze MG. (2007). NS1 truncation as natural adjuvant and means of attenuation: testing a new live vaccine in a macaque model of influenza pathogenesis*, J Virol*, 81:11817-11827. PMCID:2168783
- Martin DA, Zhang K, Kenkel J, Hughes G, Clark E, Davidson A, Elkon KB. (2007). Autoimmunity stimulated by adoptively transferred dendritic cells is initiated by both aß and γδ T-cells but does not require MyD88 signaling, *J Immunol*, 179:5819-5828. PMID: 17947655
- Hughes GC, Thomas S, Li C, Murali-Krishna K, Clark EA. (2008). Cutting Edge: Progesterone regulates IFN-α production by plasmacytoid dendritic cells, *J Immunol* 180:2029-33. PMID: 18250406
- Santos L, Draves KE, Boton M, Grewal PK, Marth JD, Clark EA. (2008). Dendritic cell-dependent inhibition of B cell proliferation requires CD22, *J Immunol* 180:4561-9. PMID: 18354178
- Chappell CP, Clark EA. (2008). Survival niches: B cells get MIFed as well as BAFFled by dendritic cells. *Immunol Cell Biol*. 86:487-8. PMID: 18504451
- Richards S, Watanabe C, Santos L, Craxton A, Clark EA. (2008). Regulation of B-cell entry into the cell cycle. *Immunol Rev* 224:183-200. PMID: 18759927
- Watanabe C, Shu GL, Zheng TS, Flavell RA, Clark EA. (2008).Caspase-6 regulates B cell activation and differentiation into plasma cells, *J Immunol,* 181:6810-6819. PMID:18981099
- Chino T, Santer D, Giordano D, Chen C, Li C, Chen CH, Darveau RP, Clark EA.(2009) Effect of oral commensal and pathogenic bacteria on human dendritic cells. Oral Micro Immunol, 24:96-103.

BIOGRAPHICAL SKETCH

NAME Cookson, Brad T.	POSITION TITLE Professor
eRA COMMONS USER NAME btcookson	

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	YEAR(s)	FIELD OF STUDY
University of Utah	B.S.	1983	Biochemistry
Washington University, St. Louis, MO	M.D., Ph.D.	1991	Medicine/Microbiology
University of Washington, Seattle, WA	Residency	1991-1994	Pathology
University of Washington, Seattle, WA	Post-doc	1994-1997	Immunology

A. Professional Positions

1993-1996 Acting Assistant Professor, Department of Laboratory Medicine, University of Washington
1996-2002 Assistant Professor, Departments of Laboratory Medicine and Microbiology, University of Washington
2002-2008 Associate Professor, Departments of Laboratory Medicine and Microbiology, University of Washington
2008-present Professor, Departments of Laboratory Medicine and Microbiology, University of Washington

B. Selected Peer-reviewed Publications (in chronological order)

1. Smith, KD, E Andersen-Nissen, F Hayashi, K Strobe, MA Bergman, SL Rassoulian Barrett, **BT Cookson,** A Aderem. 2003. Toll-like Receptor-5 recognizes an evolutionarily conserved site on bacterial flagellin required for protofilament formation and bacterial motility. Nature Immunology 4(12):1247-1253.
2. Selvarangan, R, U Bui, AP Limaye, and **BT Cookson.** 2003. Rapid Identification of Commonly Encountered *Candida* Species Directly from Blood Culture Bottles. J Clin Micro 41: 5660-5664.
3. Vasquez-Torres, A, BA Vallance, MA Bergman, BB Finlay, **BT Cookson,** J Jones-Carson, and FC Fang. 2004. TLR4-dependence of innate and adaptive immunity to Salmonella: Importance of the Kupfer cell network. J Immunol 172: 6202-6208
4. Pottumarthy, S, JM Schapiro, JL Prentice, YB Houze, SR Swanzy, FC Fang, and **BT Cookson.** 2004 Clinical isolates of *Staphylococcus intermedius* masquerading as Methicillin-resistant *Staphlococcus aureus*. J Clin Microbiol 42(12): 5881-5884.
5. Bergman, MA, LA Cummings, SL Rassoulian Barrett, KD Smith, JC Lara, A Aderem, **BT Cookson.** 2005. CD4+ T cells and Toll-like receptors recognize *Salmonella* antigens expressed in bacterial surface organelles. Infect Immun 73(3): 1350-1356.
6. Fink, SL and **BT Cookson.** 2005. Apoptosis, pyroptosis, and necrosis: Mechanistic description of dead and dying eukaryotic cells. Infect Immun 73(4): 1907-1916.
7. Cummings, LA, SL Rassoulian-Barrett, W David Wilkerson, I Fellnerova, **BT Cookson.** 2005. FliC-specific CD4+ T cell responses are restricted by bacterial regulation of antigen expression. J Immunol 174: 7929-7938.
8. Andersen-Nissen, E, KD Smith, KL Strobe, SL Rassoulian Barrett, **BT Cookson,** SM Logan, A Aderem. 2005. Evasion of Toll-like receptor 5 TLR5 by flagellated bacteria. Proc Natl Acad Sci USA 102(26): 9247-9252.

9. Rakeman, JL, U Bui, K LaFe, MB Coyle, **BT Cookson.** 2005. Multilocus DNA sequence comparisons rapidly identify pathogenic molds. J Clin Microbiol 43(7): 3324-3333.
10. Nichols, WG, J Prentice, Y Houze, L Carlson, **BT Cookson.** 2005. Fatal pulmonary infection associated with a novel organism "*Parastreptomyces abscessus.*" J Clin Microbiol. 43(10): 5376-79.
11. Bergman, MA, LA Cummings, RC Alaniz, L Mayeda, I Fellnerova, and **BT Cookson.** 2005. CD4+ T cell responses generated during murine *Salmonella enterica* serovar typhimurium infection are directed towards multiple epitopes within the natural antigen FliC. Infect. Immun. 73(11): 7226-35.
12. Cummings, LA, WD Wilkerson, TL Bergsbaken, and **BT Cookson.** 2006. In vivo, fliC expression by Salmonella enterica serovar Typhimurium is heterogeneous, regulated by ClpX, and anatomically restricted. Mol. Microbiol. 61(3): 795-809.
13. Fink, SL and **BT Cookson.** 2006. Caspase-1-dependent pore formation during pyroptosis leads to osmotic lysis of infected host macrophages. Cell Microbiol. Nov. 8(11): 1812-25.
14. Alaniz, RA, LA Cummings, MA Bergman, SL Rassoulian-Barrett and **BT Cookson.** 2006. *Salmonella typhimurium* coordinately regulates FliC location and surface modifications to reduce DC activation and antigen presentation to CD4+ T cells. J. Immunol. 177: 3983-93.
15. Fink, SL and **BT Cookson.** 2006. Caspase-1-dependent pore formation during pyroptosis leads to osmotic lysis of infected host macrophages. Cell Microbiol. 8(11): 1812-1825.
16. Sobhani, K, SL Fink, **BT Cookson,** and NJ Dovichi. 2007. Repeatability of chemical cytometry: Two dimensional capillary electrophoresis analysis of single RAW 264.7 macrophage cells. Electrophoresis. 28: 2308-2313.
17. Fink, S.L, and **BT Cookson.** Pyroptosis and host cell death responses to *Salmonella* infection. 2007. Cell Microbiol. 9(11): 2562-70.
18. Bergsbaken, TL, and **BT Cookson.** 2007. Macrophage activation redirects *Yersinia*-infected host cell death from apoptosis to Caspase-1-dependent pyroptosis. PLoS Pathogens. 3(11): e161.
19. Alaniz, RC, BL Deatherage, J Cano Lara, and **BT Cookson.** 2007. Membrane vesicles are immunogenic facsimiles of *Salmonella typhimurium* that potently activate dendritic cells, prime protective B- and T-cell responses, and stimulate protective immunity in vivo. J. Immunol. 179: 7692-7701.
20. Hansen, GT, SR Swanzy, R Gupta, **BT Cookson**, and AP Limaye. 2008. *In vitro* activity of fluoroquinolones against clinical isolates of Nocardia identified by partial 16S rRNA sequencing. Eur J Clin Microbiol Infect Dis. 27(2): 115-120.
21. Fink, SL, TL Bergsbaken, and **BT Cookson.** 2008. Anthrax lethal toxin and *Salmonella* elicit the common cell death pathway of caspase-1-dependent pyroptosis via distinct mechanisms. Proc. Natl. Acad. Sci. USA. 105(11):4312-7.
22. Goodyear N, BK Ulness, JL Prentice, **BT Cookson,** and AP Limaye. 2008. Systematic assessment of culture review as a tool to assess errors in the clinical microbiology laboratory. Arch. Path. and Lab Medicine. 132(11): 1792–95.
23. Dragavon, J, T Molter, C Young, T Strovas, S McQuaide, M Holl, M Zhang, **B Cookson,** A Jen, M Lidstrom, D Meldrum, and L Burgess. 2008. A cellular isolation system for real-time single cell oxygen consumption monitoring. J Royal Soc Interface. October 6, Vol. 5(Supp 2): S151-9.
24. Harrington, AT., CJ Creutzfeldt, DJ SenGupta, DR.Hoogestraat, JR Zunt, and **BT Cookson**. 2009. Diagnosis of neurocysticercosis by detection of *Taenia solium* DNA using a global DNA screening platform. Clin Infect Dis. 48(1): 86-90.
25. Harrington, AT, JA Castellanos, TM Ziedalski, JE Clarridge III, and **BT Cookson**. 2009. Isolation of *Bordetella avium* and novel *Bordetella* strain from patients with respiratory disease. Emerg Inf Dis. 1(1): 72-74.
26. Bergsbaken, T, SL Fink and **BT Cookson**. 2009. Pyroptosis: host cell death and inflammation. Nat Rev Microbiol. 7(2): 99-109.

BIOGRAPHICAL SKETCH

NAME Fang, Ferric C, M.D.	POSITION TITLE Professor
eRA COMMONS USER NAME fcfang	

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

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	YEAR(s)	FIELD OF STUDY
Harvard College	A.B. magna cum laude	1979	Biology
Harvard Medical School	M.D.	1983	Medicine

C. Positions and Honors. List in chronological order previous positions, concluding with your present position. List any honors. Include present membership on any Federal Government public advisory committee.

Professional Training and Experience

1983 - 1986 Intern/ Resident, Department of Medicine, U. of California San Diego (UCSD)
1986 - 1987 Chief Resident, Department of Medicine, UCSD
1987 - 1989 Post-doctoral Fellow, UCSD, Laboratory of Donald Helinski
1989 - 1990 Post-doctoral Fellow, UCSD, Laboratory of Donald Guiney
1990 - 1992 Adjunct Instructor of Medicine, UCSD
1992 - 1997 Assistant Professor of Medicine, Pathology, and Microbiology, U. of Colorado (UCHSC)
1992 - 2001 Director, Clinical Microbiology Laboratory, University of Colorado Hospital
1996 - 2001 Member, NIH Bacteriology-Mycology 1 Study Section
1997 - 2001 Associate Professor of Medicine, Pathology, and Microbiology, UCHSC
2001 - present Professor of Laboratory Medicine and Microbiology, U. of Washington
2001 - present Director, Clinical Microbiology Laboratory, Harborview Medical Center
2002 - present Adjunct Professor of Medicine, U. of Washington
2003 - present Director, NIH T32 Training Grant in Bacterial Pathogenesis

Honors and Awards

National Merit Scholar, 1975
Phi Beta Kappa, 1979
Kaiser Permanente Teaching Awards, 1985 & 1987
NIH Physician-Scientist Award, 1987-1992
UCSD Senior and Chief Residents' Teaching Awards, 1992
ASM Baxter Diagnostics MicroScan Young Investigator Award, 1994
UCHSC Outstanding Infectious Diseases Educator Award, 1995
American Society for Clinical Investigation, elected 1998
MidWest Microbial Pathogenesis Meeting Keynote Speaker, 1998
James Biundo Foundation Award, 1998 and 1999
ASM Division B Lecturer, 2000
Vice-Chair, ASM General Meeting, 2001-2004
Advisory Editor, Journal of Experimental Medicine, 2002-2005
Editor, Infection and Immunity, 2002-2007
Harry F. Dowling Lecturer, Univ. of Illinois, 2003
Chair, ASM General Meeting, 2004-2007
Abraham I. Braude Visiting Professor, UCSD, 2005

Editor-In-Chief, Infection and Immunity, 2007-2012
American Academy of Microbiology, elected 2007

D. Selected peer-reviewed publications (in chronological order). - FROM 106 TOTAL (excluding abstracts)

1. Schapiro J., S. J. Libby, and **F.C. Fang**. Inhibition of Bacterial DNA Replication by Zinc Mobilization During Nitrosative Stress. *Proc Natl Acad Sci USA 100*:8496-8501, 2003.
2. Vazquez-Torres, A., B. A. Vallance, M. A. Bergman, B. B. Finlay, B. T. Cookson, J. Jones-Carson and **F. C. Fang**. TLR4-dependence of innate and adaptive immunity to *Salmonella*: Importance of the Kupffer cell network. J Immunol 172:6202-6208, 2004.
3. **Fang, F.C.** Phagocyte antimicrobial actions of reactive oxygen and nitrogen species: Current concepts and controversies, Nature Rev Microbiol 2:820-832, 2004.
4. Crouch, M.L., L.A. Becker, I.S. Bang, H. Tanabe, A.J. Ouellette and **F.C. Fang**. The alternative sigma factor s^E is required for resistance of *Salmonella enterica* serovar Typhimurium to antimicrobial peptides. Mol Microbiol 56:789-99, 2005. Bang, I.S., J.G. Frye, M. McClelland, J. Velayudhan and **F.C. Fang**. Sigma factor interactions in *Salmonella*: s^E and s^H promote antioxidant defenses by enhancing s^S levels. Mol Microbiol 56:811-23, 2005.
5. Becker, L.A., I.S. Bang, M.L. Crouch and **F.C. Fang**. Compensatory role of PspA, a member of the phage shock protein operon, in *rpoE* mutant *Salmonella enterica* serovar Typhimurium. Mol Microbiol 56:1001-1016, 2005.**6**. **Fang, F.C.** Sigma cascades in prokaryotic regulatory networks. Proc Natl Acad Sci USA 102:4933-4934, 2005.
6. Navarre W.W., S. Porwollik, Y. Wang, M. McClelland, H. Rosen, S.J. Libby, and **F.C. Fang**. Selective silencing of foreign DNA with low GC content by the H-NS protein in *Salmonella*. Science. 313:236-238, 2006.
7. Richardson A.R., P.M. Dunman and **F.C. Fang**. The nitrosative stress response of *Staphylococcus aureus* is required for resistance to innate immunity. Mol Microbiol. 61:927-939, 2006.
8. Bang I.S., L. Liu, A. Vazquez-Torres, M.L. Crouch, J.S. Stamler and **F.C. Fang**. Maintenance of nitric oxide and redox homeostasis by the *Salmonella* flavohemoglobin Hmp. J Biol Chem. 281:28039-28047. 2006.
9. Velayudhan J., M. Castor, A. Richardson, K.L. Main-Hester and **F.C. Fang**. The role of ferritins in the physiology of *Salmonella enterica* sv. Typhimurium: a unique role for ferritin B in iron-sulphur cluster repair and virulence. Mol Microbiol. 63:1495-1507, 2007.
10. Walthers, D., R.K. Carroll, W.W. Navarre, S.J. Libby, **F.C. Fang** and L.J. Kenney. The response regulator SsrB activates expression of diverse *Salmonella* pathogenicity island 2 promoters and counters silencing by the nucleiod-associated protein H-NS. Mol Microbiol. 65:477-93, 2007.
11. Crouch M.L., M. Castor, J.E. Karlinsey, T. Kalhorn and **F.C. Fang**. Biosynthesis and IroC-dependent export of the siderophore salmochelin are essential for virulence of *Salmonella enterica* serovar Typhimurium. Mol Microbiol. 67:971-83, 2008.
12. Richardson, A.R., S.J. Libby and **F.C. Fang**. A nitric oxide-inducible lactate dehydrogenase enables *Staphylococcus aureus* to resist innate immunity. Science. 319:1672-6, 2008.
13. Muller, C., I.S. Bang, J. Velayudhan, J. Karlinsey, K. Papenfort, J. Vogel and **F.C. Fang**. Acid stress activation of the sigma(E) stress response in *Salmonella enterica* serovar Typhimurium. Mol Microbiol. 2009 Jan 23 (epub ahead of print).

BIOGRAPHICAL SKETCH

NAME Greenberg, Everett Peter	POSITION TITLE Professor, Dept of Microbiology University of Washington School of Medicine
eRA COMMONS USER NAME EPGREEN	

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	YEAR(s)	FIELD OF STUDY
Western Washington University, Bellingham WA	BA	1970	Biology
University of Iowa	MS	1972	Microbiology
University of Massachusetts Amherst	PhD	1977	Microbiology
Harvard University, Cambridge MA	Postdoctoral	1978	Biological Sciences

Please refer to the application instructions in order to complete sections A, B, and C of the Biographical Sketch.

A. RESEARCH AND PROFESSIONAL EXPERIENCE

1974-1977 NIH Predoctoral Trainee, University of Massachusetts
1977-1978 NIH Postdoctoral Fellow & Harvard Postdoc. Fellow, Harvard University
1978-1984 Assistant Professor, Cornell University
1982-1988 Editorial Board, Annual Reviews of Microbiology
1982-1992 Editorial Board, Journal of Bacteriology
1984-1988 Associate Professor (with tenure), Cornell University
1985-1989 Co-Director, Microbiology Summer Program, Marine Biological Laboratory
1987 Elected Member, American Academy of Microbiology, Elected Member, New York Academy of Sciences, Elected Member, Marine Biological Labs, ASM Foundation Lecturer
1987-1990 ASM Minority Student Career Support Program, lecturer
1988-1990 Associate Professor (with tenure), University of Iowa
1988-2000 Associate Editor, Annual Reviews of Microbiology
1989 Elected Fellow, American Association for the Advancement of Science
1990 Professor, University of Iowa
1991-2001 Editor, Journal of Bacteriology
1991-2005 Associate Director, University of Iowa Cystic Fibrosis Research Center
1997-2000 Director, NSF Gene Regulation in Bioremediation-Research Training Program
2000 Appointed Shepperd Professor of Molecular Pathogenesis
2002-2005 Director, W. M. Keck Foundation Microbial Communities and Cell Signaling Program
2002 Elected Fellow, American Academy of Arts and Sciences
2003 Elected American Academy of Microbiology Board of Governors
2004 Elected Fellow, National Academy of Sciences
2005-2007 Professor and Chair, Department of Microbiology, University of Washington
2007- Professor, Department of Microbiology, University of Washington

B. PUBLICATIONS (2004-present)

1. Urbanowski M. L., C. P. Lostroh and E. P. Greenberg. 2004. Reversible acyl-homoserine lactone binding to purified *Vibrio fischeri* LuxR protein. J Bacteriol 186:631-637.

2. J. M. Yarwood, D. J. Bartels, E. M. Volper and E. P. Greenberg. 2004. Quorum sensing in *Staphylococcus aureus* biofilms. J Bacteriol. 186:1838-1850.

3. Chun, C. K., E. A. Ozer, M. J. Welsh, J. Zabner and E. P. Greenberg. 2004. Inactivation of a

Pseudomonas aeruginosa quorum-sensing signal by human airway epithelia. Proc Natl Acad Sci USA. 101:3587-3590.
4. Schuster, M., A. C. Hawkins, C. S. Harwood, E. P. Greenberg. 2004. The *Pseudomonas aeruginosa* RpoS regulon and its relationship to quorum sensing. Mol Microbiol. 51:973-985.
Bagge N. M. Schuster, M. Hentzer, O. Ciofu, M. Givskov, E. P. Greenberg and N. Hoiby. 2004. *Pseudomonas aeruginosa* biofilms exposed to imipenem exhibit changes in global gene expression and beta-lactamase and alginate production. Antimicrob. Agents Chemother. 48:1175-1187.
5. Matsukawa, M., and E. P. Greenberg EP. 2004. Putative exopolysaccharide synthesis genes Influence *Pseudomonas aeruginosa* biofilm development. J Bacteriol. 186:4449-4456.
6. Schuster, M., M. L. Urbanowski and E. P. Greenberg. 2004. Promoter specificity in *Pseudomonas aeruginosa* quorum sensing revealed by DNA binding of purified LasR. Proc Natl Acad Sci U S A. 101: 15833-39.
7. Yahr, T. L. and E.P. Greenberg. 2004. The genetic basis for the commitment to chronic versus acute infection in *Pseudomonas aeruginosa*. Molecular Cell. 16:497-498.
8. Lequette, Y. and E. P. Greenberg. 2005. Timing and localization of rhamnolipid synthesis gene expression in *Pseudomonas aeruginosa* biofilms. J Bacteriol. 187:37-44.
9. Parsek, M. R, and E. P. Greenberg. 2005. Sociomicrobiology: the connections between quorum sensing and biofilms. Trends Microbiol. 13:27-33.
Ruby E.G., M. Urbanowski, J. Campbell, A. Dunn, M. Faini, R. Gunsalus, P. Lostroh, C. Lupp, J. McCann,
10. D. Millikan, A. Schaefer, E. Stabb, A. Stevens, K. Visick, C. Whistler and E. P. Greenberg. 2005. Complete genome sequence of *Vibrio fischeri*: A symbiotic bacterium with pathogenic congeners. Proc Natl Acad Sci USA. 102:304-309.
11. Dong, Y. H., X. F. Zhang, H. M. Soo, E. P. Greenberg and L. H. Zhang. 2005. The two-component response regulator PprB modulates quorum-sensing signal production and global gene expression in *Pseudomonas aeruginosa*. Mol Microbiol. 56:1287-1301.
12. Yarwood, J. M., E. M. Volper and E. P. Greenberg. 2005. Delays in *Pseudomonas aeruginosa* quorum-controlled gene expression are conditional. Proc Natl Acad Sci U S A. 102:9008-9013.
13. Banin, E., M. L. Vasil and E. P. Greenberg. 2005. Iron and *Pseudomonas aeruginosa* biofilm formation. Proc Natl Acad Sci U S A. 102:11076-110C. 81.
14. Ozer, E. A., A. Pezzulo, D. M. Shih, Chun, C. Furlong, A. J. Lusis, E. P. Greenberg and J. Zabner. 2005. Human and murine paraoxonase 1 are host modulators of *Pseudomonas aeruginosa* quorum-sensing. FEMS Microbiol Lett. 253:29-37.
15. Sonnleitner, E., M. Schuster, T. Sorger-Domenigg, E. P. Greenberg and U. Bläsi. 2006. Hfq-dependent alterations of the transcriptome profile and effects on quorum sensing in *Pseudomonas aeruginosa*. Mol Microbiol. 59:1542-1558.
16. Schuster, M. and E. P. Greenberg. 2006. A network of networks: Quorum-sensing gene regulation in *Pseudomonas aeruginosa.* Int. J. Med. Microbiol. 296: 73-81.
17. Lee, J-H., Y. Lequette and E. P. Greenberg. 2006. Activity of purified QscR, a *Pseudomonas aeruginosa* orphan quorum-sensing transcription factor. Mol Microbiol. 59:602-609.
18. Banin, E., K. M. Brady and E. P. Greenberg. 2006. Chelator-induced dispersal and killing of *Pseudomonas aeruginosa* cells in a biofilm. Appl Environ Microbiol. 72:2064-2069.
19. Lequette, Y., J. H. Lee, F. Ledgham, A. Lazdunski and E. P. Greenberg. 2006. A distinct QscR regulon in the *Pseudomonas aeruginosa* quorum-sensing circuit. J Bacteriol. 188:3365-3370.
20. Kolter R. and E. P. Greenberg. 2006. Microbial sciences: the superficial life of microbes. Nature 441:300-302.
21. Müh U., M. Schuster, R. Heim, A. Singh, E. Olson, E. P. Greenberg. 2006. Characterization of Novel *Pseudomonas aeruginosa* Quorum sensing inhibitors identified in an ultrahigh-throughput screen. Antimicrob Agents Chemother. 50:3674-3679.
22. Eckert, R., K. M. Brady, E. P. Greenberg, F. Qi, D. K. Yarbrough, I. McHardy, M. H. Anderson and W. Shi. 2006. Antimicrob Agents Chemother. Enhancement of antimicrobial activity against *Pseudomonas aeruginosa* by co-administration of G10KHc and tobramycin. 50:3833-3838.32.
23. Muh, U., B. J. Hare, B. A. Duerkop, M. Schuster, B. L. Hanzelka, R. Heim, E. R. Olson and E. P. Greenberg. 2006. A structurally unrelated mimic of a *Pseudomonas aeruginosa* acyl-homoserine lactone quorum-sensing signal. Proc Natl Acad Sci USA. 103:16948-16952.

24. Chugani, S. and E. P. Greenberg 2007. The influence of human respiratory epithelia on *Pseudomonas aeruginosa* gene expression. Microb. Pathog. 42:29-35.
25. Duerkop, B. A., R. L. Ulrich and E. P. Greenberg. 2007. Octanoyl-Homoserine Lactone is the Cognate Signal for *Burkholderia mallei* BmaR1-BmaI1 Quorum Sensing. J. Bacteriol. 189:5034-5040.
26. Schuster, M. and E. P. Greenberg. LuxR-type proteins in *Pseudomonas aeruginosa* quorum sensing: distinct mechanisms with global implications. Expected to appear in *Cell-cell communication in bacteria*. ASM Press.
27. Schuster, M. and E. P. Greenberg. LuxR-type proteins in *Pseudomonas aeruginosa* quorum sensing: distinct mechanisms with global implications. To appear in *Bacterial Communication* edited by B. L. Bassler and S. C. Winans. ASM Press, Washington, DC
28. Schuster, M. and E. P. Greenberg. 2007. Early activation of quorum sensing in *Pseudomonas aeruginosa* reveals the architecture of a complex regulon. BMC Genomics. 8: 287 (on-line).
29. Yarwood J. M., K. M. Paquette, I. B. Tikh, E. M. Volper, and E. P. Greenberg 2007. Generation of virulence factor variants in *Staphylococcus aureus* biofilms. J. Bacteriol. 189: 7961-7967.
30. Antunes L. C,, A. L. Schaefer, R. B. Ferreira, N. Qin, A. M. Stevens, E. G. Ruby and E. P. Greenberg. 2007. A transcriptome analysis of the *Vibrio fischeri* LuxR-LuxI regulon. J. Bacteriol. 189: 8387-8391.
31. Lequette, Y., E. Rollet, A. Delangle, E. P. Greenberg and J-P Bohin. 2007. Linear osmoregulated periplasmic glucans are encoded by the *opgGH* locus of *Pseudomonas aeruginosa*. Microbiology. 153: 3255-3263.
32. Patriquin G. M., E. Banin, C.Gilmour, Tuchman, E. P. Greenberg and K. Poole. 2008. Influence of quorum sensing and iron on twitching motility and biofilm formation in *Pseudomonas aeruginosa*. J. Bacteriol. 190: 662-671.
33. Ferreira, R. B., L. C. Antunes, E. P. Greenberg and L. L. McCarter. 2008. *Vibrio parahaemolyticus* ScrC modulates cyclic dimeric GMP regulation of gene expression relevant to growth on surfaces.J. Bacteriol. 190: 851-860.
34. Rampioni, G., M. Schuster, E. P. Greenberg, I. Bertani, M. Grasso, V. Venturi, E. Zennaro, L. Leoni. 2007. RsaL provides quorum sensing homeostasis and functions as a global regulator of gene expression in *Pseudomonas aeruginosa*. Mol Microbiol. 66: 155715-65.
35. Banin, E. and E. P. Greenberg. 2008. Ironing out the biofilm problem: the role of iron in biofilm formation. Biofilms. Ed. N. Balaban. Springer.
36. Mattmann, M. E., G. D. Geske, G. A. Worzalla, J. R. Chandler, K. J. Sappington, E. P. Greenberg and H. E. Blackwell. 2008. Synthetic ligands that activate and inhibit a quorum-sensing regulator in *Pseudomonas aeruginosa*. Bioorg Med Chem Lett. 18:3072-3075.
37. Antunes, L.C., R. B. Ferreira, C. P. Lostroh and E. P. Greenberg. 2008. A Mutational Analysis Defines *Vibrio fischeri* LuxR Binding Sites. J Bacteriol. 190: 851-860.
38. Duerkop B. A, J. P. Herman, R. L. Ulrich, M. E. Churchill and E. P. Greenberg. 2008. The *Burkholderia mallei* BmaR3-BmaI3 quorum-sensing system produces and responds to N-3-Hydroxy-octanoyl homoserine lactone. J Bacteriol. 190:137-141.
39. Schaefer A. L., E. P. Greenberg, C. M. Oliver, Y. Oda , J. J. Huang, G. Bittan-Banin , C. M. Peres, S. Schmidt , K. Juhaszova, J. R. Sufrin, and C. S. Harwood. 2008. A new class of homoserine lactone quorum sensing signal. Nature. 454:595-599.
40. Gibbs K. A., Urbanowski M. A. and E. P. Greenberg. 2008. Social recognition in bacteria. Science. 321:256-259.

BIOGRAPHICAL SKETCH

NAME Harwood, Caroline Stone	POSITION TITLE Professor
eRA COMMONS USER NAME CAROLINE HARWOOD	

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	YEAR(s)	FIELD OF STUDY
Colby College, Waterville, ME	B.A.	1973	Biology
Boston University, Boston, MA	M.A.	1976	Biology
University of Massachusetts, Amherst, MA	Ph.D.	1982	Microbiology
Yale University, New Haven, CT	Postdoc	1982-84	Biology

Positions and employment

1984-1988 Senior Research Associate, Cornell University
1988-1993 Assistant Professor, University of Iowa
1993-1996 Associate Professor, University of Iowa
1996-2004 Professor, University of Iowa
2005- Professor, University of Washington

Professional activities

1991-1994 National Science Foundation Advisory Panel - Metabolic Biochemistry
1991-1996 Editorial Board, the journal, *Applied and Environmental Microbiology*
1993-1996 Editorial Board, *Journal of Bacteriology*
1996-1998 Chair and Chair-elect, Division K (Microbial Physiology), American Society for Microbiology
1996-2006 Editor, the journal, *Applied and Environmental Microbiology*
1997-1999 Foundation for Microbiology Lecturer
1999-2004 Director, Gene Regulation in Bioremedation-Research Training Program (NSF)
2000-2003 Director, Summer Course in Microbial Diversity, Marine Biological Laboratory, Woods Hole, MA
2000-2004 American Society for Microbiology Press Committee
2001-2003 Divisional Group IV Representative (Molecular Biology, Physiology & Virology), American Society for Microbiology.
2001-2004 National Science Foundation Advisory Panel – Postdoctoral Fellowships in Microbial Biology
2004- Awards Committee, American Academy of Microbiology
2004- Chair, American Society for Microbiology Press Committee
2006- Associate Editor, Annual Review of Microbiology
2008- Editorial Advisory Board, Molecular Microbiology

Honors

2002 Elected, Fellow American Academy of Microbiology
2006 Appointed Gerald and Lyn Grinstein Endowed Professor in Microbiology
2009 Elected, Fellow American Association for the Advancement of Science (AAAS)

B. Selected peer-reviewed publications

Oda Y., F. W. Larimer, P. S. Chain, S. Malfatti, M. V. Shin, L. M., Vergez, L. Hauser, M. L. Land, S. Braatsch, J. T. Beatty, D. A. Pelletier, A. L. Schaefer and **C. S. Harwood**. 2008. Multiple genome sequences reveal adaptations of a phototrophic bacterium to sediment microenvironments. Proc. Natl. Acad. Sci. USA. 105:18543-18548. Epub 2008 Nov 1

Schaefer, A. L., E. P. Greenberg, C. M. Oliver, Y. Oda, J. J. Huang, G. Bittan-Banin, C. M. Peres, S. Schmidt, K. Juhaszova, J. R. Sufrin and **C. S. Harwood**. 2008. A new class of homoserine lactone quorum-sensing signals. Nature 454:595-599.

Hickman, J. W. and **C. S. Harwood**. 2008. Identification of FleQ from *Pseudomonas aeruginosa* as a c-di-GMP-responsive transcription factor. Mol. Microbiol. **69**:376-389. [Epub ahead of print. May 27 doi:10.1111]

Pan, C., Y. Oda, P. K. Lankford, B. Zhang, N. F. Samatova, D. A. Pelletier, **C. S. Harwood**, and R.L. Hettich. 2008. Characterization of anaerobic catabolism of p-coumarate in *Rhodopseudomonas palustris* by integrating transcriptomics and quantitative proteomics. Mol. Cell. Proteomics. **7**:938-948.

Güvener, Z.T. and **C. S. Harwood.** 2007. Subcellular location characteristics of the *Pseudomonas aeruginosa* GGDEF protein, WspR, indicate that it produces cyclic-di-GMP in response to growth on surfaces. Mol. Microbiol. **66**:1459-147.

Alvarez-Ortega, C. and **C. S. Harwood.** 2007. Identification of a malate chemoreceptor in *Pseudomonas aeruginosa* by screening for chemotaxis defects in an energy taxis-deficient mutant. Appl. Environ.Microbiol. **73**:7793-7795.

Alvarez-Ortega, C. and **C. S. Harwood.** 2007. Responses of *Pseudomonas aeruginosa* to low oxygen indicate that growth in the cystic fibrosis lung is by aerobic respiration. Mol. Microbiol.**65**:153-165.

Rey, F. E., E. K. Heiniger and **C. S. Harwood**. 2007. Redirection of metabolism for biological hydrogen production. Appl. Environ. Microbiol. **73**:1665-1671

Gosse, J. L., B. J. Engel, F. Rey, **C. S. Harwood**, L. E. Scriven and M. C. Flickinger, 2007 Hydrogen production by nano-porous laxtex coating of non-growing *Rhodopseudomonas palustris* CGA009. Biotechnology Prog. **23**:124-130.

Braatsch, S., J. R. Bernstein, F. Lessner, J. Morgan, J. C. Liao, **C. S. Harwood** and J. T. Beatty. 2006. *Rhodopseudomonas palustris* CGA009 has two *ppsR* genes that each encode repressors of photosynthesis gene expression. Biochemistry **45**: 14441-14451.

Peres. C. M. and **C. S. Harwood.** 2006. BadM is a transcriptional repressor and one of three regulators that controls benzoyl-CoA reductase gene expression in *Rhodopseudomonas palustris*. J. Bacteriol. **188**:8662-8665.

Güvener, Z.T., D. F. Tifrea and **C. S. Harwood**. 2006. Two different *Pseudomonas aeruginosa* chemosensory signal transduction complexes localize to cell poles and form and remold in stationary phase. Mol. Microbiol. **61**:106-118.

VerBerkmoes, N. C., M. B. Shah, P. K. Lankford, D. A. Pelletier, M. B. Strader, D. L. Tabb, W. H. McDonald, J. W. Barton, G. B. Hurst, L. Hauser, B. H. Davison, J. T.Beatty, **C. S. Harwood**, F. R. Tabita, R. L. Hettich, and F. W. Larimer. 2006 Determination and comparison of the baseline proteomes of the versatile microbe *Rhodopseudomonas palustris* under its major metabolic states. J. Proteome Research. **5**:287-298.

Hickman J.W., D. F. Tifrea and **C. S. Harwood**. 2005. A chemosensory system that regulates biofilm formation through modulation of cyclic diguanylate levels. Proc. Natl. Acad. Sci. U S A.**102**:14422-14427.

Oda, Y., S. K. Samanta, F. Rey, L. Wu, X.-D. Liu, T.-F. Yan, J. Zhou, and **C. S. Harwood.** 2005. Functional genomic analysis of three nitrogenase isozymes in *Rhodopseudomonas palustris*. J. Bacteriol. **187**:7784- 7794.

Samanta, S. K. and **C. S. Harwood**. 2005. Use of the *Rhodopseudomonas palustris* genome to identify a single amino acid that contributes to the activity of a coenzyme A ligase with chlorinated substrates. Mol. Microbiol. **55**:1151-1159.

Parales, R. E., A. Ferrández, and **C.S. Harwood**. Chemotaxis in Pseudomonads. 2004. Vol I pp 793-815. In: The Pseudomonads, J.L. Ramos, ed, Kluwer Academic/Plenum Press.

Larimer, F. W., P. Chain, J. Lamerdin, S. Stilwagen Malfatti, L. Do, M. Land, L. Hauser, D. A. Pelletier, J. T. Beatty, A. S. Lang, F. R. Tabita, J. L. Gibson, T. E. Hanson, C. Bobst, J. Torres Y Torres, C. Peres, F. Harrison, J. Gibson and **C. S. Harwood**. 2004. The genome sequence of the metabolically versatile photosynthetic bacterium *Rhodopseudomonas palustris.* Nature Biotech. **22**:55-61.

BIOGRAPHICAL SKETCH

NAME Katze, Michael G.	POSITION TITLE Professor of Microbiology Associate Director, Washington National Primate Research Center
eRA COMMONS USER NAME (credential, e.g., agency login)	

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	YEAR(s)	FIELD OF STUDY
Boston University, Boston, Mass.	B.A.	1971	Biology
Hahnemann University, Philadelphia, Pa.	Ph.D.	1980	Microbiology
University of Uppsala, Uppsala, Sweden	Post-doc	1980–1982	Virology

A. Positions and Honors.

Positions

1972–1973 Research Assistant, Wistar Institute, Philadelphia, Pa.
1974–1976 Research Assistant, University of Pennsylvania, Department of Microbiology, Philadelphia, Pa.
1982–1984 Research Associate, Sloan-Kettering Institute, New York, N.Y.
1984–1986 Assistant Member, Sloan-Kettering Institute, New York, N.Y.
1987–1991 Assistant Professor, Department of Microbiology, University of Washington, Seattle, Wash.
1987– Core Staff Scientist, Washington National Primate Research Center, UW, Seattle, Wash.
1991–1995 Associate Professor, Department of Microbiology, University of Washington, Seattle, Wash.
1995– Professor, Department of Microbiology, University of Washington, UW, Seattle, Wash.
1996– Associate Director, Washington National Primate Research Center, UW, Seattle, Wash.
1996–1999 Member, Experimental Virology Study Section (NIH)

Honors

1971 Boston University *magna cum laude,* Phi Beta Kappa
1980–1982 Long-term Postdoctoral Fellowship, European Molecular Biology Organization
1998 Faculty Award for Undergraduate Research Mentoring
1998 Travel Award, ISICR International Meeting in Jerusalem
1999 Milstein Award, ISICR International Meeting in Paris
2006 Dozor Scholar Award, Israeli Microbiology Society
2006 Alumni Fellow Award, Drexel University (Hahnemann University) College of Medicine

B. Selected Peer-Reviewed Publications. (From over 190 papers and reviews)

Kash, J.C., E. Mühlberger, V. Carter, M. Grosch, O. Perwitasari, S.C. Proll, M.J. Thomas, F. Weber, H.-D. Klenk, and **M.G. Katze**. 2006. Global suppression of the host antiviral response by Ebola and Marburg viruses: increased antagonism of the type 1 interferon response is associated with enhanced virulence. *J. Virol.* 80:3009–3020.

Smith M.W., K.-A. Walters, M.J. Korth, M. Fitzgibbon, S. Proll, J.C. Thompson, M.W. Yeh, M.C. Shuhart, J.C. Furlong, P.P. Cox, D.L. Thomas, J.D. Phillips, J.P. Kushner, N. Fausto, R.L. Carithers Jr., and **M.G. Katze**. 2006. Gene expression patterns that correlate with hepatitis C and early progression to fibrosis in liver transplant patients. *Gastroenterology* 130:179–187.

Walters, K.-A., M.A. Joyce, J.C. Thompson, M.W. Smith, M.M. Yeh, S. Proll, L.-F. Zhu, T.J. Gao, N.M. Kneteman, D.L. Tyrrell, and **M.G. Katze**. 2006. Host-specific response to HCV infection in the chimeric SCID-beige/Alb-uPA mouse model: role of the innate antiviral immune response. *PLoS Pathog.* 2:e59.

Oyadomari, S., C. Yun, E.A. Fisher, N. Kreglinger, G. Kreibich, M. Oyadomari, H.P. Harding, A.G. Goodman, **M.G. Katze**, and D. Ron. 2006. Co-translocational degradation protects the stressed endoplasmic reticulum from misfolded client protein overload. *Cell* 126:727–739.

Baas, T., C. R. Baskin, D. L. Diamond, A. Garcia-Sastre, H. Bielefeldt-Ohmann, T. M. Tumpey, M. J. Thomas, V. S. Carter, T. H. Teal, N. Van Hoeven, S. C. Proll, J. M. Jacobs, Z. R. Caldwell, M. A. Gritsenko, R. R. Hukkanen, D. G. Camp, R. D. Smith, and **M. G. Katze**. 2006. Integrated molecular signature of disease: analysis of influenza virus-infected macaques through functional genomics and proteomics. *J. Virol.* 80:10813-10828.

Kash, J. C., T. M. Tumpey, S. C. Proll, V. Carter, O. Perwitasare, M. J. Thomas, C. F. Basler, P. Palese, J. K. Taubenberger, A. Garcia-Sastre, D. E. Swayne, and **M. G. Katze**. 2006. Genomic analysis of increased host immune and cell death responses by 1918 influenza virus. *Nature.* 443:578-581.

Lederer, S. L., K. A. Walters, S. Proll, B. Paeper, S. Robinzon, L. Boix, N. Fausto, J. Bruix, and **M. G. Katze**. 2006. Distinct cellular responses differentiating alcohol- and hepatitis C virus-induced liver cirrhosis. *Virol. J.* 3:98.

Goodman, A.G., J. A. Smith, S. Balachandran, O. Perwitasari, S. C. Proll, M. J. Thomas, M. J. Korth, G. N. Barber, L. A. Schiff, and **M. G. Katze**. 2007. The cellular protein P58^{IPK} regulates influenza virus mRNA translation and replication through a PKR-mediated mechanism. *J. Virol.* 81:2221-2230.

Gibbs, R.A., J. Rogers, **M.G. Katze**, R. Bumgarner, G.M. Weinstock, et al. 2007 Evolutionary and biomedical insights from the rhesus macaque genome. *Science* 316:222-234.

Wallace, J. C., M. J. Korth, B. W. Paeper, S. C. Proll, M. J. Thomas, C. L. Magness, S. P. Iadonato, C. Nelson, and **M.G. Katze**. 2007. High-density rhesus macaque oligonucleotide microarray design using early-stage rhesus genome sequence information and human genome annotations. *BMC Genomics.* 8:28.

Kobasa, D., S. M. Jones, K. Shinya, J. C. Kash, J. Copps, H. Ebihara, Y. Hatta, J. H. Kim, P. Halfmann, M. Hatta, F. Feldmann, J. B. Alimonti, L. Fernando, Y. Li, **M.G. Katze**, H. Feldmann, and Y. Kawaoka. 2007. Aberrant innate immune response in lethal infection of macaques with the 1918 influenza virus. *Nature* 445:319-323.

Chan, E. Y., W.-J. Qian, D. L. Diamond, T. Liu, M. A. Gritsenko, M. E. Monroe, D. G. Camp, R. D. Smith, and **M.G. Katze**. 2007. Quantitative analysis of HIV-1 infected CD4+ cell proteome: dysregulated cell cycle progression and nuclear transport coincide with robust virus production. *J. Virol.* 81:7571-7583.

Diamond, D.L., J.M. Jacobs, B. Paeper, S.C. Proll, M.A. Gritsenko, R.L. Carithers, A.M. Larson, D.G. Camp, R.D. Smith, and **M.G. Katze**. 2007. Proteomic profiling of human liver biopsies: hepatitis C virus-induced fibrosis and mitochondrial dysfunction. *Hepatology.* 46:649–657.

Li, Y., E. Y. Chan, and **M.G. Katze**. 2007. Functional genomics analyses of differential macaque peripheral blood mononuclear cell infections by human immunodeficiency virus-1 and simian immunodeficiency virus. *Virology*. 366:137–149.

Rutkowski, D. T., S. W. Kang, A. G. Goodman, J. L. Garrison, J. Taunton, M. G. Katze, R. J. Kaufman, and R. S. Hegde. 2007. The role of p58IPK in protecting the stressed endoplasmic reticulum. *Mol. Cell. Biol.* 18:3681–3691.

Tang, W., C. Lazaro, J. Campbell, T. Parks, **M.G. Katze**, and N. Fausto. 2007. Responses of non-transformed human hepatocytes to conditional expression of full-length hepatitis C virus open reading frame. *Am. J. Pathol.* 171:1831–1846.

de Lang, A., T. Baas, T. Teal, L.M. Leitjen, B. Rain, A.D. Osterhaus, B.L. Haagmans, and **M.G. Katze**. 2007. Functional genomics highlights differential induction of antiviral pathways in the lungs of SARS-CoV-infected macaques. *PloS Pathog.* 3:e112.

Baskin, C.R., H. Bielefeldt-Ohmann, A. García-Sastre, T.M. Tumpey, N. Van Hoeven, V.S. Carter, M.J. Thomas, S. Proll, A. Solórzano, R. Billharz, J.L. Fornek, S. Thomas, C.H. Chen, E.A. Clark, M.K. Kaja, and **M.G. Katze**. 2007. Functional genomic and serological analysis of the protective immune response resulting from vaccination of macaques with an NS1-truncated influenza virus. *J. Virol.* 81:11817–11827.

Fredericksen, B.L., B.C. Keller, J. Fornek, **M.G. Katze**, and M. Gale, Jr. 2007. Establishment and maintenance of the innate antiviral response to West Nile Virus requires both RIG-I and MDA5 signaling through IPS-1. *J. Virol.* 82:335–345.

Loo, Y.-M., J. Fornek, N. Crochet, G. Bajwa, O. Perwitasasri, L. Martinex-Sobrido, S. Akira, M.A. Gill, A. Garcia-Sastre, **M.G. Katze**, and M. Gale, Jr. 2007. Distinct RIG-I and MDA5 signaling by RNA viruses in innate immunity. *J. Virol.* 82:335–345.

Borozan, I., L. Chen, B. Paeper, J.E. Heathcote, A.M. Edwards, **M. Katze**, Z. Zhang, and I.D. McGilvrey. 2008. MAID: an effect-sized based model for microarray data integration across laboratories and platforms. *BMC Bioinformatics* 9:305.

Baas, T., A. Roberts, T.H. Teal, L. Vogel, J. Chen, T.M. Tumpey, **M.G. Katze**, and K. Subbaro. 2008. Genomic analysis reveals age-dependent innate immune responses to SARS coronavirus. *J. Virol.* 82:9465–9476.

Ajioka,R.S., J.D. Philips, R.B. Weiss, D.M. Dunn, M.W. Smit, S.C. Proll, **M.G. Katze**, and J.P. Kushner. 2008. Down-regulation of hepcidin in porphyria cutanea tarda. *Blood* 112:4723–4728.

Baskin, C.R., H. Bielefeldt-Ohmann, T.M. Tumpey, P.J. Sabourin, J.P. Long, A. García-Sastre, A.-E. Tolnay, R. Albrecht, J.A. Pyles, P. Olson, L.D. Aicher, E.R. Rosenzweig, M.K. Kaja, E.E. Clark, M.S. Kotur, J.L. Fornek, S. Proll, R.E. Palermo, C.L. Sabourin, and **M.G. Katze**. 2009. Early and sustained innate immune response defines pathology and death in highly pathogenic influenza-infected nonhuman primates. *Proc. Natl. Acad. Sci. USA* In press.

Degenhardt, J.D., P. de Candia, A. Chabot, S. Schwartz, L. Henderson, B. Ling, M. Hunter, Z. Jiang, R.E. Palermo, **M.G. Katze**, E.E. Eichler, M. Ventura, J. Rogers, P. Marx, Y. Gilad, C.D. Bustamante. 2009. Copy number variation of CCL3-like genes affects rate of progression to simian AIDS in rhesus macaques (*Macaca mulatta*). *PLoS Genet.* 5:e1000346.

Favre, D., S. Lederer, B. Kanwar, Z.M. Ma, S. Proll, Z. Kasakow, J. Mold, L. Swainson, J.D. Barbour, C.R. Baskin, R. Palermo, C.J. Miller, **M.G. Katze**, and J.M. McCune. 2009. Critical loss of the balance between Th17 and T regulatory cell populations in pathogenic SIV infection. *PLoS Pathog.* In press.

Joyce, M.A., K.-A. Walters, S.-E. Lamb, M.M. Yeh, N. Kneteman, J. Doyle, **M.G. Katze**, and D.L. Tyrell. 2009. HCV induces oxidative and ER stress and sensitizes infected cells to apoptosis in *SCID/Alb-uPA* mice. *PLoS Pathog.* In Press.

Lederer, S., D. Favre, K.-A. Walters, S. Proll, B. Kanwar, Z. Kasakow, C.R. Baskin, R. Palermo, J.C. McCune, and **M.G. Katze**. 2009. Transcriptional profiling reveals significant distinctions in kinetics and tissue compartmentalization between pathogenic and nonpathogenic SIV infection. *PLoS Pathog.* In press.

Pasieka, T.J., C. Cilloniz, B. Lu, T.H. Teal, S.C. Proll, **M.G. Katze**, and D.A. Leib. 2009. Host responses to wild type and attenuated herpes simplex virus infection in the absence of STAT1. *J. Virol.* In press.

Rutkowski, D.T., J. Wu, S.-H. Back, M.U. Callaghan, S.P. Ferris, J. Iqbal, R. Clark, H. Miao, J.R. Hassler, J. Fornek, **M.G. Katze**, M.M. Hussain, B. Song, J. Swathirajan, J. Wang, G.D.-Y. Yau, and R.J. Kaufman. 2008. UPR pathways combine to prevent hepatic steatosis caused by ER stress-mediated suppression of transcriptional master regulators. *Dev. Cell* 15:829–840.

Walters, K.-A., A.J. Synder, S.L. Lederer, D.L. Diamond, B. Paeper, C.M. Rice, and **M.G. Katze**. 2009. Genomic analysis reveals a potential role for cell cycle perturbation in HCV-mediated apoptosis of cultured hepatocytes. *PLoS Pathog.* 5:e1000269. PMCID: PMC2613535

BIOGRAPHICAL SKETCH

NAME Lagunoff, Michael	POSITION TITLE Associate Professor
eRA COMMONS USER NAME Lagunoff	

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	YEAR(s)	FIELD OF STUDY
Oberlin College	B.A.	1987	Chemistry
University of Chicago	Ph.D.	1995	Virology
University of California, San Francisco	Post. Doc.	1996-2000	Microbiology/Immuno.

A. Positions and Honors

Positions:

2007-present Associate Professor, Dept. of Microbiology, University of Washington
Adjunct Associate professor, Dept. of Immunology, University of Washington

2001-2007 Assistant Professor, Dept of Microbiology, University of Washington
Adjunct Assistant Professor, Dept of Immunology, University of Washington

Honors:

American Cancer Society Research Scholar 2005-09
PEW Biomedical Scholar 2002-06
CFAR UW new investigator award 2001-02
Leukemia and Lymphoma Society Special Fellow 1999-2001.

Memberships and editorial boards:

Editorial boards:
Virology 2007-2010
Member:
American Society of Microbiology
American Association for the Advancement of Science

B. Selected peer-reviewed publications.

1. Randall G, **Lagunoff M**, Roizman B. Oct 2000. Herpes simplex virus 1 open reading frames O and P are not necessary for establishment of latent infection in mice. *Journal of Virology*. 74:9019-9027.
2. **Lagunoff M**, Lukac DM, Ganem D. Jul 2001. Immunoreceptor tyrosine-based activation motif-dependent signaling by Kaposi's sarcoma-associated herpesvirus K1 protein: effects on lytic viral replication. *Journal of Virology*. 75:5891-5898.
3. **Lagunoff M**, Bechtel, J, Venetsanakos, E, Roy, A-M, Abbey, N, Herndier, B, McMahon, M, and Ganem D. March 2002. De novo infection and serial transmission of Kaposi's sarcoma-associated herpesvirus (KSHV) in cultured endothelial cells. *Journal of Virology* 76:2440-2448.
4. **M. Lagunoff** and P.A. Carroll 2003. Inhibition of Apoptosis By The g-Herpesviruses. *International Reviews of Immunology*. 22:373-99.
5. Carroll, PA, Brazeau, E and **Lagunoff, M**. 2004. Kaposi's sarcoma-assoicated herpesvirus 6 of blood endothelial cells induces lymphatic differentiation. Virology, 328:7-18.

6. Chen, L and **Lagunoff, M**. 2005. Establishment and maintenance of Kaposi's Sarcoma-associated herpesvirus in B-cells. Journal of Virology, 79:14383-91
7. Carroll, P.A., Kenerson, HL, Yeung, RS and **M. Lagunoff**. 2006. Latent Kaposi's Sarcoma-associated herpesvirus infection of endothelial cells induces Hypoxia induced transcription factors. Journal of Virology. 80:10802-12
8. Rose, P.P, J.M. Carroll, V.R. DeFilippis, P.A. Carroll, **M. Lagunoff**, A.V. Moses, C.T. Roberts jr. and K. Fruh. 2007. The Insulin Receptor is essential for virus-induced tumorigenesis of Kaposi's Sarcoma. Oncogene, 26:1995-2005.
9. Chen, L and **Lagunoff, M**. 2007. The KSHV viral IL-6 gene is not essential for latency or lytic replication in BJAB cells. Virology, 359:425-35.
10. Punjabi, A.S., Carroll, PA, Chen, L. and **Lagunoff, M**. 2007. Persistent activation of STAT3 by latent KSHV infection of Endothelial cells. Journal of Virology 81:2449-58.
11. Orr, M.T., Mathis, M.A., **Lagunoff, M**., Sacks, J.A. and Wilson C.B. 2007. CD8 T cell control of HSV reactivation from latency is abrogated by viral inhibition of MHC class I. Cell Host and Microbe 2:172-80.
12. Morris, VA, Punjabi, AS and **Lagunoff, M.** 2008. Activation of AKT through the gp130 receptor is required for KSHV induced lymphatic reprogramming. Journal of Virology 82:8771-79
(selected for spotlight on articles of significant interest in Journal of Virology)

CURRICULUM VITAE

Jimmie Cano Lara, Ph.D.

WORK Department of Microbiology Sc-42
School of Medicine
University of Washington
Seattle, WA 98195
(206) 543-6340

EDUCATION

1965	B.A., California State College, Los Angeles, CA Microbiology
1967	M.S., California State College, Los Angeles, CA Microbiology
1970	Ph,D., University of California, Riverside, CA Biology

POSTGRADUATE TRAINING

1970-72	Postdoctoral Research Biologist, University of California, San Diego, CA

FACULTY POSITIONS

1972-78	Assistant Professor, Department of Microbiology, School of Medicine University of Washington Seattle, WA
1978-present	Associate Professor, Department of Microbiology,
August 1, 2000- February 2005	Associate Chair, Department of Microbiology

PUBLICATIONS

Jelesko, J. G., J. C. Lara, and J. A. Leigh. Rhizobium meliloti Mutants with Decreased DAHP Synthase Activity are Sensitive to Exogenous Tryptophan and Phenylalanine and Form Ineffective Nodules. In Press Molecular Plant Microbe Interactions 1993.

Leah R. Turner, J. Cano Lara, D. N. Nunn, and S. Lory. Mutations in the Consensus ATP-Binding Sites of XcpR and PilB Eliminate Extracellular Protein Secretion and Pilus Biogenesis in Pseudomonas aeruginosa. J. Bacteriol. 175:4962-4969, 1993.

Marcus J. Korth, J. Cano Lara, and Steve L Moseley. Epithelial Cell Invasion by Bovine Septimcemic Escherichia coli. Infection and Immunity 62:41-47, 1994.

Totten, Patrica A., Lara J. C., Norn, D. V., and Stamm, W. E. Haemophilus ducreyi Attaches To and Invades Cultured Human Foreskin Epithelial Cells In Virto. Infection and Immunity 62(12):5632-5640, 1994.

Ozga, David A, Lara, J. C., Leigh, J. A. The Regulation of Exopolysaccharide Production is Important at Two Levels of Nodule Development in Rhizobium meliloti. Mol Plant-Microbe Interactions 7(6):758765, 1994.

Humbert, Richard, Withington, A. P., Richter, R. J., Chadsey, M.S., McEwen, N., Gray J., Lara J. C., Staley, J. T., Harrington, M. J., Thomas, L. C., Li, W., Costa, L. G., Herrington, R.T., Sayles, G.D., Haynes, J., and Furlong, C. E. Specific Approaches to Bioremediation. In Advances in Hazardous Waste Management Technologies, Robert Irwin and subias Sikdar, eds., Technomic Pub.Co., Lancaster, Pennsylvania, 1995.

Fullner, Karla J., Lara J. C., Nester, E. W. Pilus Assembly by Agrobacterium T-DNA Transfer Genes. Science 273:1107-1109, 1996.

Furlong, C. E., Humbert, R., Withington, A. P., Richter, R. J., Chadsey, M. S., McEwen, N., Gray, J., Lara, J. C., Staley, J. T., Li, W, and Costa, L. G. Specific Approaches to Bioremediation. In Bioremediation: Principles and Practice- Fundamentals and Applications- Vol 2, S. Sikdar and R. L. Irvine, eds., Technomic Pub.Co., Lancaster, Pennsylvania, 1998.

Rhohinee N. P., Lara, J. C., Pepe J. C., Pepe C. M. N., Strom, M. S. The Type IV Leader Peptidase-N-methyltransferase of *Vibrio vulnificus* Controls Factors Required for Adherence to Hep-2 Cells and Virulence in Iron-overloaded Mice. Infection and Immunity 66(12):5659-5668, 1999

Bergman, M.A., Cummings, l., Barrett, S., Smith, K, Lara, J.C., Aderem, A., Cookson, B. T. CD4+ T cells and Toll-like Receptors recognize *Salmonella* antigens expressed in bacterial surface organelles. Infection and Immunity 73 (3): 1350-1356. 2005.

Miller J.A., M.G. Kalyuzhnaya, E. Noyes, J.C. Lara, M.E. Lidstrom, and L. Chistoserdova. Labrys methylaminophilus Gen. Nov., Sp. Nov., a new facultatively methylotrophic bacterium from a freshwater lake sediment. Internat. J. Syst. Evol. Microbiol. 2005 (IJSEM Papers in Press -- Published online 14 January 2005 ashttp://dx.doi.org/10.1099/ijs.0.63409-0I).

Kalyuzhnay, M. G., J. C. Lara, etc. Methylosarcina lacus sp. Nov., a methanotroph from Lake Washington, Seattle, USA. IJSEM (International Journal of Systematic and Evolutionary Microbiology. 2005.

Alaniz, R.C, D. L. Deatherage, J. C. Lara, B. T. Cookson. Membrane Vesicles Are Immunogic Facsimiles of *Salmonella typhimurium* That Potently Activate Dendritic Cells, Prime B and T Cell Responses, and Stimulate Protective Immunity In Vivo. The Journal of Immunology 179: 7692-7701. 2007

BIOGRAPHICAL SKETCH

NAME Leigh, John A.	POSITION TITLE Professor
eRA COMMONS USER NAME JALeigh	

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	YEAR(s)	FIELD OF STUDY
Swarthmore College	B.S.	1976	Biology
University of Illinois	M.S.	1979	Microbiology
University of Illinois	Ph.D.	1983	Microbiology

A. POSITIONS AND HONORS

1983-85 Postdoctoral Fellow, Department of Biology, Massachusetts Institute of Technology
1985-1992 Assistant Professor, Department of Microbiology, University of Washington
1993-1994 Visiting Scientist, Laboratoire de Biologie Moléculaire des Relations Plantes-Microorganismes, Toulouse, France
1992-2005 Associate Professor, Department of Microbiology, University of Washington
2005-present Professor, Department of Microbiology, University of Washington

Honors and Fellowships:

1986 Presidential Young Investigator Award
1986 Searle Scholarship

B. SELECTED PEER-REVIEWED PUBLICATIONS (in chronological order)

Kessler, P. S., C. Daniel, and J. A. Leigh. 2001. Ammonia switch-off of nitrogen fixation in the methanogenic archaeon *Methanococcus maripaludis*: mechanistic features and requirement for the novel GlnB homologues, $NifI_1$ and $NifI_2$. J. Bacteriol. 183:882-889.

Galagan, J. E. et. al. (33rd of 55 authors). 2002. The genome of *M. acetivorans* reveals extensive metabolic and physiological diversity. Genome Research 12:532-542.

Lie, T. J. and J. A. Leigh. 2002. Regulatory response of *Methanococcus maripaludis* to alanine, an intermediate nitrogen source. J. Bacteriol. 184:5301-5306.

Lie, T. J. and J. A. Leigh. 2003. A novel repressor of *nif* and *glnA* expression in the methanogenic archaeon, *Methanococcus maripaludis*. Molecular Microbiol. 47:235-246.

Wood, G. E, A. K. Haydock, and J. A. Leigh. 2003. Function and regulation of the formate dehydrogenase genes of the methanogenic archaeon *Methanococcus maripaludis*. J. Bacteriol. 185:2548-2554.

Haydock, A. K., I. Porat, W. B. Whitman, and J. A. Leigh. 2004. Continuous culture of *Methanococcus maripaludis* under defined nutrient conditions. FEMS Microbiol. Lett. 238:85-91.

Hendrickson, E. L., R. Kaul, Y. Zhou, D. Bovee, P. Chapman, J. Chung, E. Conway de Macario, J. A. Dodsworth, W. Gillett, D. E. Graham, M. Hackett, A. K. Haydock, A. Kang, M. L. Land, R. Levy, T. J. Lie, T. A. Major, B. C. Moore, I. Porat, A. Palmeiri, G. Rouse, C. Saenphimmachak, D. Söll, S. Van Dien, T. Wang, W. B. Whitman, Q. Xia, Y. Zhang, F. W. Larimer, M. V. Olson, and J. A. Leigh. 2004. Complete genome sequence of the genetically tractable hydrogenotrophic methanogen *Methanococcus maripaludis*. J. Bacteriol. 186:6956-69.

Moore, B. and J. A. Leigh. 2005. Markerless mutagenesis in *Methanococcus maripaludis* demonstrates roles for alanine dehydrogenase, alanine racemase, and alanine permease. J. Bacteriol. 187:972-979.

Dodsworth, J. A., N. C. Cady, and J. A. Leigh. 2005. 2-oxoglutarate and the PII homologues $NifI_1$ and $NifI_2$ regulate nitrogenase activity in cell extracts of *Methanococcus maripaludis*. Molecular Microbiol. 56:1527-1538.

Lie, T. J., G. E. Wood, and J. A. Leigh. 2005. Regulation of *nif* expression in *Methanococcus maripaludis*: Roles of the euryarchaeal repressor NrpR, 2-oxoglutarate, and two operators. J. Biol. Chem. 280:5236-5241.

Porat, I., W. Kim, E. L. Hendrickson, Q. Xia, Y. Zhang, T. Wang, F. Taub, B. C. Moore, I. J. Anderson, M. Hackett, J. A. Leigh, and W. B. Whitman. 2006. Disruption of the *ehb* operon limits anabolic CO_2 assimilation in the archaeon *Methanococcus maripaludis*. J. Bacteriol. 188:1373-1380.

Xia, Q., E. L. Hendrickson, Y. Zhang, T. Wang, F. Taub, B. C. Moore, I. Porat , W. B. Whitman, M. Hackett, and J. A. Leigh. 2006. Quantitative proteomics of the archaeon *Methanococcus maripaludis* validated by microarray analysis and real time PCR. Molecular and Cellular Proteomics 5:868-881.

Dodsworth, J. A. and J. A. Leigh. 2006. Regulation of nitrogenase by 2-oxoglutarate-reversible, direct binding of a PII-like nitrogen sensor protein to dinitrogenase. Proc. Natl. Acad. Sci. USA 103:9779-9784.

Hendrickson, E. L., Q. Xia, T. Wang, J. A. Leigh, and M. Hackett. 2006. Comparison of spectral counting and metabolic stable isotope labeling for use with quantitative microbial proteomics. Analyst 131:1335-1341.

Leigh, J. A. and J. A. Dodsworth. 2007. Nitrogen regulation in Bacteria and Archaea. Annu. Rev. Microbiol. 61:349-377.

Xia, Q., E. L. Hendrickson, T. Wang, R. J. Lamont, J. A. Leigh, and M. Hackett. 2007. Protein abundance ratios for global studies of prokaryotes. Proteomics 7: 2904-2919.

Stolyar, S., S. Van Dien, K. L. Hillesland, N. Pinel, T. J. Lie, J. A. Leigh, and D. A. Stahl. 2007. Metabolic modeling of a mutualistic microbial community. Mol. Syst. Biol. 3:92.

Lie, T. J., J. A. Dodsworth, D. Nickle and J. A. Leigh. 2007. Diverse homologs of the archaeal repressor NrpR function similarly in nitrogen regulation. FEMS Microbiol. Lett. 271:281-288.

Hendrickson, E. L., A. K. Haydock, B. C. Moore, W. B. Whitman, and J. A. Leigh. 2007. Functionally distinct genes regulated by hydrogen limitation and growth rate in methanogenic Archaea. Proc. Natl. Acad. Sci. USA 104:8930-8934.

Xia, Q., E. L. Hendrickson, T. Wang, R. J. Lamont, J. A. Leigh, and M. Hackett. 2007. Protein abundance ratios for global studies of prokaryotes. Proteomics 7:2904-19.

Lie, T. J. and J. A. Leigh. 2007. Genetic screen for regulatory mutations in *Methanococcus maripaludis* and its use in identification of induction-deficient mutants of the euryarchaeal repressor NrpR. Appl. Environ. Microbiol. 73:6595-6600.

Dodsworth, J. A., and J. A. Leigh. 2007. NifI inhibits nitrogenase by competing with Fe protein for binding to the MoFe protein. Biochem. Biophys. Res. Commun. 364:378-382.

Hendrickson, E. L., Y. Liu, G. Rosas-Sandoval, I. Porat, D. Söll, W. B. Whitman, and J. A. Leigh. 2008. Global responses of *Methanococcus maripaludis* to specific nutrient limitations and growth rate. J. Bacteriol. 190:2198-2205.

Hendrickson, E. L., and J. A. Leigh. 2008. Roles of coenzyme F_{420}-reducing hydrogenases and hydrogen- and F_{420}-dependent methylenetetrahydromethanopterin dehydrogenases in reduction of F_{420} and production of hydrogen during methanogenesis. J. Bacteriol. 190:4818-4821.

Lupa, B., E. L. Hendrickson, J. A. Leigh, and W. B. Whitman. 2008. Formate-dependent H_2 production by the mesophilic methanogen *Methanococcus maripaludis*. Appl. Environ. Microbiol. 74:6584-6590.

BIOGRAPHICAL SKETCH

NAME	POSITION TITLE
Mary E. Lidstrom eRA COMMONS USER NAME lidstrom	Jungers Professor of Engineering Professor of Microbiology

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

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	YEAR(s)	FIELD OF STUDY
Oregon State University, Corvallis, OR	B.S.	1973	Microbiology
University of Wisconsin, Madison, WI	M.S.	1975	Bacteriology
University of Wisconsin, Madison, WI	Ph.D.	1977	Bacteriology

Professional Experience:

1977–1978	Leverhulme Visiting Fellow, Microbiology University of Sheffield, Sheffield, England
1978–1985	Assistant & Associate Professor, Microbiology, University of Washington
1985–1987	Associate Scientist, Center for Great Lakes Studies, University of Wisconsin-Milwaukee
1987–1991	Associate Professor, Applied Microbiology, Environmental Engineering, California Institute of Technology
1991–1996	Professor, Applied Microbiology, Environmental Engineering, California Institute of Technology
1996-	Jungers Professor of Chemical Engineering and Professor of Microbiology, University of Washington
1997-2005	Associate Dean for New Initiatives in Engineering (half-time), University of Washington
2005-	Vice Provost for Research (three quarter time), University of Washington

Recent Honors and Awards:

1992	Fellow of the American Academy of Microbiology
1996	Jungers Endowed Chair, UW
1997-00	Board of Governors, American Academy of Microbiology
2000	Editorial Board, Microbiology (UK)
2003	Howard Hughes Medical Institute Professor Award
2005	Fellow of the American Association for the Advancement of Science
2006	American Society for Microbiology Graduate Teaching and Mentoring Award

Selected Publications(out of over 190 peer reviewed publications)

1. Chistoserdova L., Laukel M, Portais JC, Vorholt JA, and Lidstrom ME. 2004. Multiple formate dehydrogenase enzymes in the facultative methylotroph *methylobacterium extorquens* AM1 are dispensable for growth on methanol. J. Bacteriol. 186:22-28.
2. Korotkova N, Lidstrom ME. 2004. MeaB is a component of the methylmalonyl-CoA mutase complex required for protection of the enzyme from inactivation. J Biol Chem. 279(14):13652-8.
3. Marx CJ, Lidstrom ME. 2004. Development of an insertional expression vector system for *Methylobacterium extorquens* AM1 and generation of null mutants lacking *mtdA* and/or *fch*. Microbiology. 150:9-19.
4. Chistoserdova L, Jenkins C, Kalyuzhnaya M, Marx CJ, Lapidus A, Vorholt JA, Staley JT, Lidstrom ME. 2004. The enigmatic planctomycetes may hold a key to the origins of methanogenesis and methylotrophy. Mol Biol Evol. 21:1234-1241.
5. Marx CJ, Miller JA, Chistoserdova L, Lidstrom ME. 2004. Formaldehyde oxidation/detoxification pathways in *Burkholderia fungorum* LB400. J Bacteriol. 186(7):2173-8.
6. Hope JL, Prazen BJ, Nilsson EJ, Lidstrom ME and Synovec RE. 2004. Comprehensive two-dimensional gas chromatography with time-of-flight mass spectrometry detection: analysis of amino acid and organic

acid trimethylsilyl derivatives, with application to the analysis of metabolites in rye grass samples. Talanta 65:380-388.
7. Kalyuzhnaya MG, Lidstrom ME, and Chistoserdova L. 2004. Utility of environmental probes targeting ancient enzymes: methylotroph detection in Lake Washington. Microb. Ecol. 2004 48(4): 463-472.
8. Korotkova N, Lidstrom ME, and Chistoserdova L. Identification of genes involved in the glyoxylate regeneration cycle in *methylobacterium extorquens* am1 including two new genes, *meaC* and *meaD*. J. Bacteriol. 2005, 187(4): 1523-1526.
9. Chistoserdova L, Rasche ME, and Lidstrom ME. Novel dephospho-tetrahydromethanopterin biosynthesis genes discovered via mutagenesis in *Methylobacterium extorquens* AM1. J. Bacteriol. 2005, 187 (7):2508-2512.
10. Kaluzhnaya MG, Stolyar SM, Auman AJ, Lara JC, Lidstrom ME, and Chistoserdova L. *Methylosarcina lacus* sp. nov., a methanotroph from Lake Washington, Seattle, USA. Int. J. Syst. Evol. Microbiol. 2005 Nov; 55(Pt 6):2345-2350..
11. Schmid AK, Howell HA, Battista JR, Peterson SN, and Lidstrom ME. HspR is a global negative regulator of heat shock gene expression in *Deinococcus radiodurans*. Molec. Microbiol. 55(5): 1579-1590.
12. Chistoserdova L, Vorholt JA, and Lidstrom ME. A genomic view of methane oxidation by aerobic bacteria and anaerobic archaea. Genome Biol. 2005. 6(2): Art. No. 208.
13. Marx CJ, Van Dien S, and Lidstrom ME. 2005. Flux analysis uncovers key role of functional redundancy in formaldehyde metabolism. PloS Biology 2005 3(2): 244-253.
14. Kalyuzhnaya MG, Nercessian O, Lapidus A, and Chistoserdova L. Fishing for biodiversity: novel methanopterin-linked C1 genes deduced from the Sargasso Sea metagenome. Environ. Microbiol. 2005 Dec;7(12):1909-1916.
15. Miller JA, Kalyuzhnaya MG, Noyes E, Lara JC, Lidstrom ME, and Chistoserdova L. *Labrys methylaminophilus* Gen. Nov., Sp. Nov., a novel facultatively methylotrophic bacterium from a freshwater lake sediment. Internat. J. Syst. Evol. Microbiol. 2005 May;55(Pt 3):1247-1253.
16. Kalyuzhnaya MG, and Chistoserdova L. Community-level analysis: genes encoding methanopterin-dependent enzymes. Meth. Enzymol. 2005;397:443-454.
17. Schmid AK, Lipton MS, Mottaz H, Monroe ME, Smith RD, and Lidstrom ME. Global whole-cell FTICR mass spectrometric proteomics analysis of the heath shock response in the radioresistant bacterium, J. Proteome Res. 2005 May-Jun;4(3):709-718.
18. Schmid AK, Howell HA, Battista JR, Peterson SN, and Lidstrom ME. Global transcriptional and proteomic analysis of the Sig1 heat shock regulon of *Deinococcus radiodurans*. J. Bacteriol. 2005 May;187(10):3339-3351.
19. Kalyuzhnaya MG, Nercessian O, Lidstrom ME, and Chistoserdova L. Development and application of polymerase chain reaction primers based on fhcD for environmental detection of H_4MPT-linked C1 metabolism in bacteria. Environ. Microbiol. 2005 August;7(8):1269-1274.
20. Kalyuzhnaya MG, Korotkova N, Crowther G, Marx C, Lidstrom ME, and Chistoserdova L. Analysis of gene islands involved in methanopterin-linked c1 transfer reactions reveals new functions and provides evolutionary insights. J. Bacteriol. 2005 July;187(13):4607-4614.
21. Zhang M, FitzGerald KA, Lidstrom ME. Identification of an upstream regulatory sequence that mediates the transcription of mox genes in *Methylobacterium extorquens* am1. Microbiology. 2005 Nov;151(Pt 11):3723-3728.
22. Nercessian O, Noyes E, Kalyuzhnaya MG, Lidstrom ME, Chistoserdova L. Bacterial populations active in metabolism of C_1 compounds in the sediment of Lake Washington, a freshwater lake. Appl. Envir. Microbiol. 2005 Nov;71(11):6885-6899.
23. Vorholt JA, Kalyuzhnaya MG, Hagemeier C, Lidstrom ME, Chistoserdova L. MtdC, a novel class of methylene tetrahydromethanopterin dehydrogenases. J. Bacteriol. 2005 Sep;187(17):6069-6074..
24. McDonald IR, Smith K, and Lidstrom ME (2005). Methanotrophic populations in estuarine sediment from Newport Bay, California. FEMS Microbiol. Lett. 2005 Sep 15;250(2):287-293.
25. Zang M, FitzGerald KA, Lidstrom ME. Identification of an upstream regulatory sequence that mediates the transcription of mox genes in *Methylobacterium extorquens* AM1. Microbiology. 2005 Nov;151(Pt 11):3723-3728.

26. Kalyuzhnaya MG, Stolyar SM, Auman AJ, Lara JC, Lidstrom ME *Methylosarcina lacus* sp. nov., a methanotroph from Lake Washington, Seattle, USA, and emended description of the genus *Methylosarcina*. Int J Syst Evol Microbiol. 2005 Nov;55(Pt 6):2345-50.
27. Kalyuzhnaya MG, Bowerman S, Nercessian O, Lidstrom, ME, Chistoserdova L. Highly divergent genes for methanopterin-linked C1 transfer reactions in Lake Washington, assessed via metagenomic analysis and mRNA detection. Appl Environ Microbiol. 2005 Dec;71(12):8846-8854.
28. Nercessian O, Kalyuzhnaya MG, Joye SB, Lidstrom ME, Chistoserdova L. *Methylosarcina lacus* sp. nov., a methanotroph from Lake Washington, Seattle, USA, and emended description of the genus Methylosarcina. Int J Syst Evol Microbiol. 2005 Nov;55(Pt 6):2345-2350.
29. Strovas TJ, Dragavon JM, Hankins TJ, Callis JB, Burgess LW, Lidstrom ME. Measurement of respiration rates of *Methylobacterium extorquens* AM1 cultures by use of a phosphorescence-based sensor. Appl Environ Microbiol. 2006 Feb;72(2):1692-1695.
30. Holland AD, Rothfuss HM, Lidstrom ME. Development of a defined medium supporting rapid growth for *Deinococcus radiodurans* and analysis of metabolic capacities. Appl Microbiol Biotechnol. 2006 Mar 31; [Epub ahead of print]
31. Kalyuzhnaya MG, Zabinsky R, Bowerman S, Baker DR, Lidstrom ME, Chistoserdova L. Fluorescence in situ hybridization-flow cytometry-cell sorting-based method for separation and enrichment of type I and type II methanotroph populations. Appl Environ Microbiol. 2006 Jun;72(6):4293-4301.
32. Guo X, Lidstrom ME. Physiological analysis of *Methylobacterium extorquens* AM1 grown in continuous and batch cultures. Arch Microbiol. 2006 Aug;186(2):139-49.
33. Rothfuss H, Lara JC, Schmid AK, Lidstrom ME.. Involvement of the S-layer proteins Hpi and SlpA in the maintenance of cell envelope integrity in *Deinococcus radiodurans* R1. Microbiology. 2006 Sep;152(Pt 9):2779-87.
34. Chistoserdova, L., Lapidus, A., Han, C., Goodwin, L., Saunders, L., Brettin, T., Tapia, R., Gilna, P., Lucas, S., Richardson, P.M., Lidstrom, M.E. 2007. Genome of *Methylobacillus flagellatus*, molecular basis for obligate methylotrophy, and polyphyletic origin of methylotrophy. J. Bacteriol 189(11):4020-7.
35. Xiong, X., Lidstrom, M.E., Parviz, B. 2007. Microorganisms for MEMs. J MEM Syst. 16(2):429-44.
36. Guo X, Lidstrom ME. 2008. Metabolite profiling analysis of *Methylobacterium extorquens* AM1 by comprehensive two-dimensional gas chromatography coupled with time-of-flight mass spectrometry. Biotechnol Bioeng. 99(4):929-40.
37. Okubo, Y., E. Skovran, X. Guo, D. Sivam, and M.E. Lidstrom. 2007. Implementation of microarrays for *Methylobacterium extorquens* AM1. Omics 11:325-40.
38. Young, A.C., Dragavon, J., Strovas, T., Molter, T., Lixin, Z., Burgess, L., Jen, A.K.-Y., Lidstrom, M.E., Meldrum, D.R. 2007. Two-photon lithography of platinum-porphyrin oxygen sensors. IEEE Sensors Journal. 7(6):931-6.
39. Strovas, T.J., Sauter, L.M., Guo, X., Lidstrom, M.E. 2007. Cell-to-Cell heterogeneity in growth rate and gene expression in *Methylobacterium extorquens* AM1. J Bacteriol 189:7127-33.
40. Chistoserdova L, Crowther GJ, Vorholt JA, Skovran E, Portais JC, Lidstrom ME. 2007. Identification of a fourth formate dehydrogenase in *Methylobacterium extorquens* AM1 and confirmation of the essential role of formate oxidation in methylotrophy. J Bacteriol. 189(24):9076-81. Epub 2007 Oct 5.
41. Kalyuzhnaya MG, Hristova KR, Lidstrom ME, Chistoserdova L. 2008. Characterization of a Novel Methanol Dehydrogenase in Representatives of Burkholderiales: Implications for Environmental Detection of Methylotrophy and Evidence for Convergent Evolution. J Bacteriol. 2008 Apr 4. [Epub ahead of print]
42. Crowther, G., G. Kosaly, and M.E. Lidstrom. 2008; Formate as the Main Branchpoint for Methylotrophic Metabolism in *Methylobacterium extorquens* AM1. J. Bacteriol. May 23 [Epub ahead of print]
43. Kalyuzhnaya MG, Khmelenina V, Eshinimaev B, Sorokin D, Fuse H, Lidstrom M, Trotsenko Y. 2008. Classification of halo(alkali)philic and halo(alkali)tolerant methanotrophs provisionally assigned to the genera *Methylomicrobium* and *Methylobacter* and emended description of the genus *Methylomicrobium*. Int J Syst Evol Microbiol. 58(Pt 3):591-6.
44. Bosch, Gundula ,Elizabeth Skovran, Qiangwei Xia, Tiansong Wang, Fred Taub,Jonathan A. Miller, Mary E. Lidstrom and Murray Hackett. Comprehensive proteomics of *Methylobacterium extorquens* AM1 metabolism under single carbon and non-methylotrophic conditions. Proteomics 8(17):3494-505.

45. Lan Yin, Xiaomei Zhu, Lik Wee Lee, Mary E. Lidstrom, Ping Ao. Towards Modeling Kinetics of Large Metabolic Networks: *Methylobacterium extorquens* AM1 Growth as Validation. Chinese J of Biotech 2008 Jun;24(6):980-94.
46. Kalyuzhnaya MG, Lidstrom ME, Chistoserdova L. 2008. Real-time detection of actively metabolizing microbes by redox sensing as applied to methylotroph populations in Lake Washington. ISME J. 2008 Jul;2(7):696-706.
47. Kalyuzhnaya, Marina, G., Alla Lapidus, Natalia Ivanova, Alex C. Copeland, Alice C. McHardy, Ernest Szeto, Asaf Salamov, Igor V. Grigoriev, Dominic Suciu, Samuel R. Levine, Victor M. Markowitz, Isidore Rigoutsos, Susannah G. Tringe, David C. Bruce, Paul M. Richardson, Mary. E. Lidstrom and Ludmila Chistoserdova. 2008. High-resolution metagenomics targets major functional types in complex microbial communities. Nature Biotech 26(9):1029-34.
48. Boardman AK, McQuaide SC, Zhu C, Whitmore CD, Lidstrom ME, Dovichi NJ. 2008. Interface of an array of five capillaries with an array of one-nanoliter wells for high-resolution electrophoretic analysis as an approach to high-throughput chemical cytometry. Anal Chem. 80(19):7631-4.
49. Yang, S., M. Sadilek, R. E. Synovec and M. E. Lidstrom. 2009. LC-MS/MS and GC x GC-TOFMS measurement of targeted metabolites of *Methylobacterium extorquens* AM1 grown on two different carbon sources. J. Chromatography, in press.

BIOGRAPHICAL SKETCH

NAME Miller, Samuel I.	POSITION TITLE Professor
eRA COMMONS USER NAME millersi	

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	YEAR(s)	FIELD OF STUDY
Johns Hopkins University, Baltimore, MD	BA	1975	History
Baylor College of Medicine, Houston, TX	MD	1980	Medicine

Postdoctoral training

1980-83 Intern, Jr Asst Res, Sr Asst Res, Internal Medicine, Massachusetts General Hospital, Boston
1983-84 Clinical Fellow in Medicine, Infectious Disease Unit, Massachusetts General Hospital, Boston
1984-87 Research Fellow, Tropical Public Health, Harvard School of Public Health, Boston

A. POSITIONS AND HONORS

Academic and Hospital Appointments

1980-83 Clincial Fellow in Medicine, Harvard Medical School, Boston, MA
1983-87 Clinical and Research Fellow in Medicine, Massachusetts General Hospital, Boston, MA
1984-87 Research Fellow in Tropical Public Health, Harvard School of Public Health, Boston, MA
1986-89 Instructor in Medicine, Harvard Medical School, Massachusetts General Hospital, Boston, MA
1987-89 Clinical Assistant in Medicine, Massachusetts General Hospital, Boston, MA
1989-93 Assistant Professor of Medicine, Harvard Medical School, Boston, MA
1990-93 Assistant in Medicine, Massachusetts General Hospital, Boston, MA
1993-95 Assistant Physician, Massachusetts General Hospital, Boston, MA
1993-95 Associate Professor of Medicine, Harvard Medical School, Boston, MA
1995- Attending Physician, U of Washington Medical Center, Seattle, WA
1995-98 Associate Professor of Medicine and Microbiology, U of Washington, Seattle, WA
1998-03 Professor of Medicine and Microbiology, U of Washington, Seattle, WA
2003- Professor of Genome Sciences, Medicine & Microbiology, U of Washington, Seattle, WA

Awards

1983 Cabot Foundation Fellow
1984 Marine Biology Laboratories Tuition Award
1984-87 National Research Service Award
1987-89 Rockefeller Foundation Award
1987-89 Medical Foundation Fellow (Laboratory of John Mekalanos)
1989-94 Physician Scientist Award
1994 American Society for Clinical Investigation
1997 Squibb Award, Infectious Diseases Society of America
2000 John Spitznagel Lectureship, Emory University, Atlanta GA
2003 Shipley Symposium Lecturer, Harvard Medical School, Boston, MA
2004 ASM Division B Award Lecture, New Orleans, LA
2006 American Academy of Microbiology, Fellow
2007 University of Washington, Science in Medicine Lecture, Seattle WA
2007 Marian Koshland Symposium, U. of Chicago
2008 Bruce Stocker Lecturer, Stanford University

B. SELECTED PEER-REVIEWED PUBLICATIONS (from ~170).

1. Bader MW, Sanowar S, Daley ME, Schneider AR, Cho U, Wenqing X, Klevit RE, Moual H, Miller SI. Recognition of antimicrobial peptides by a bacterial sensor kinase. Cell. 2005 Aug 12;122(3):461-72.
2. Hoffman L, D'Argenio D, MacCoss M, Zhang Z, Jones RA, and Miller SI. Aminoglycoside antibiotics induce bacterial biofilm formation. Nature. 2005 Aug 25;436(7054):1171-5.
3. Ohlson MB, Fluhr K, Birmingham CL, Brumell JH, Miller SI. SseJ deacylase activity by Salmonella enterica serovar Typhimurium promotes virulence in mice. Infect Immun. 2005 Oct;73(10):6249-59.

4. Yip CK, Kimbrough TG, Felise HB, Vuckovic M, Thomas NA, Pfuetzner RA, Frey EA, Finlay BB, Miller SI, Strynadka NC. Structural characterization of the molecular platform for type III secretion system assembly. Nature. 2005 Jun 2;435(7042):702-7.
5. Miller SI, Ernst RK, Bader MW. LPS, TLR4 & infectious disease diversity.NatRevMicro.2005 Jan;3(1)36-46.
6. Haraga A, Miller SI. A Salmonella type III secretion effector interacts with the mammalian serine/threonine protein kinase PKN1. Cell Microbiol. 2006 May;8(5):837-46.
7. Rebeil R, Ernst RK, Jarrett CO, Adams KN, Miller SI, Hinnebusch BJ. Characterization of late acyltransferase genes of Yersinia pestis and their role in temperature-dependent lipid A variation. J Bac. 2006 Feb;188(4):1381-88.
8. Miao EA, Alpuche-Aranda CM, Dors M, Clark AE, Bader MW, Miller SI, Aderem A. Cytoplasmic flagellin activates caspase-1 and secretion of interleukin 1beta via Ipaf. Nat Immunol. 2006 Jun;7(6):569-75.
9. Hager AJ, Bolton DL, Pelletier MR, Brittnacher MJ, Gallagher LA, Kaul R, Skerrett SJ, Miller SI, Guina T. Type IV pili-mediated secretion modulates Francisella virulence. Mol Micro. 2006 Oct;62(1):227-37.
10. Hoffman L, Miller SI. The systems biology of infection in animal models bears fruit. PNAS. 2006 Jun 20; 103(25); 9377-8.
11. Prost LR, Daley ME, Le Sage V, Bader MW, Le Moual H, Klevit RE, Miller SI. Activation of the bacterial sensor kinase PhoQ by acidic pH. Mol Cell. 2007 Apr 27;26(2):165-74.
12. Hoffman L, Dargenio D, Bader M, Miller SI. Microbial recognition of antibiotics: ecological, physiologic, and therapeutic implications. *Microbe*. 2007: 2:175-182.
13. Kulasekara HD,Miller SI. Threonine phosphorylation times bacterial secretion. Nat Cell Biol 2007 734-6.
14. Prost L, Sanowar S, Miller SI. *Salmonella* sensing of antimicrobial mechanisms to promote survival within macrophages. Immunol Rev. 2007 Oct;219:55-65.
15. Kline T, Trent MS, Stead CM, Lee MS, Sousa MC, Felise HB, Nguyen HV, Miller SI. Synthesis of and evaluation of lipid A modification by 4-substituted 4-deoxy arabinose analogs as potential inhibitors of bacterial polymyxin resistance. Bioorg Med Chem Lett. 2008 Feb 15;18(4):1507-10. Epub 2007 Dec 27.
16. Haraga A, Olson MB, Miller SI. Salmonellae interplay with host cells. Nat Rev Microbiol. 2007 Nov 19.
17. Miller SI, Hoffman LR, Sanowar S. Did bacterial sensing of host environments evolve from sensing within microbial communities? Cell Host Microbe. 2007 Apr 19;1(2):85-7.
18. Rohmer L, Guina T, Chen J, Gallis B, Taylor GK, Shaffer SA, Miller SI, Brittnacher MJ, Goodlett DR. Determination and Comparison of the Francisella tularensis subsp.novicida U112 Proteome to Other Bacterial Proteomes. J Proteome Res. 2008 May;7(5):2016-24. Epub 2008 Apr 2.
19. Scherl A, Shaffer SA, Taylor GK, Kulasekara HD, Miller SI, Goodlett DR. Genome-specific gas-phase fractionation strategy for improved shotgun proteomic profiling of proteotypic peptides. Anal Chem. 2008 Feb 15;80(4):1182-91.
20. Zarivach R, Deng W, Vuckovic M, Felise H, Nguyen H, Miller SI, Finlay B, Strnadka N. Struc analysis of the essential self-cleaving type III secretion proteins EscU and SpaS. Nature. 2008 May 1;453(7191):124-7
21. Felise HB, Nguyen HV, Pfuetzner RA, Barry KC, Jackson SR, Blanc MP, Bronstein PA, Kline T, Miller SI.An inhibitor of gram-negative bacterial virulence protein secretion. Cell Host Microbe. 2008 Oct 16;4(4):325-36.
22. Wasylnka JA, Bakowski MA, Szeto J, Ohlson MB, Trimble WS, Miller SI, Brumell JH. Role for myosin II in regulating positioning of Salmonella-containing vacuoles and intracellular replication. Infect Immun. 2008 Jun;76(6):2722-35.
23. Prost LR, Daley, ME, Bader MW, Klevit RE, Miller SI. The PhoQ Histidine Kinases of Salmonella and Pseudomonas spp. are structurally and functionally different: evidence that pH and antimicrobial peptide sensing contribute to mammalian pathogenesis. Mol Microbiol. 2008 Jul;69(2):503-19.
24. Kline T, Felise HB, Barry KC, Jackson SR, Nguyen HV, Miller SI. Substituted 2-Imino-5-arylidenethiazolidin-4-one Inhibitors of Bacterial Virulence Effector Type III Secretion. J Med Chem. 2008 Oct 24.
25. Ohlson MB, Huang Z, Alto NM, Blanc MP, Dickson JE, Chai J, Miller SI. Structure and function of *SifA* indicate that interactions with *SKIP, SseJ*, and *RhoA* family GTPases induce endosomal tubulation. 2008. Cell Host Microbe. 2008 Nov 13;4(5):434-46.
26. Hoffman LR, Kulasekara HD, Emerson J, Houston LS, Burns JL, Ramsey BW, Miller SI. P. aeruginosa lasR mutants are associated with CF lung disease progression. 2009. J Cyst Fibros. 8: 66-70.
27. Kline T, Jackson SR, Deng W, Verlinde CL, Miller SI. Design and Synthesis of bis-carbamate Analogs of Cyclic bis-(3'-5')-Diguanylic Acid (c-di-GMP) and the Acyclic Dimer PGPG. Nucleosides Nucleotides Nucleic Acids. 2008 Dec;27(12):1282-300.
28. Ko D, Shukla KP, Fong C, Wasnick M, Brittnacher MJ, Yserloo BV, Akey JM, Miller SI. A genome-wide bacterial infection screen reveals human variation in inflammatory signaling. Submitted for publication.
29. Spreter, T, Yip C, Sanowar S, Andre I, Kimbrough TG, Vuckovic M, Pfuetzner R, Deng W, Finlay BB, Baker D, Miller SI, Strynadka NCJ. A conserved structural motif mediates formation of the inner and outer membrane rings in the type III secretion system. In press Nature Structural Biology

BIOGRAPHICAL SKETCH

NAME Mittler, John E.	POSITION TITLE Associate Professor
eRA COMMONS USER NAME jmittler	

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	YEAR(s)	FIELD OF STUDY
University of California at Berkeley	BA	1984	Biophysics/Applied Mathematics
University of California at Irvine	PhD	1992	Biological Sciences
University of Massachusetts at Amherst	Post-doc	1992	Microbial Ecology / Evolution
Emory University , Atlanta, Georgia	Post-doc	1992-1996	Microbial Ecology / Evolution
Los Alamos National Laboratory, Los Alamos, New Mexico	Post-doc	1996-1999	Biology of HIV/AIDS

E. Positions and Honors.

Positions and Employment

1984-1985 Assistant Computer Programmer. *Relational Technology Inc*. Alameda, Calif.
1987-1989 Teaching Assistant. Dept. of Ecology and Evolutionary Biology, University of California at Irvine.
1989-1992 Research Assistant. Dept. of Ecology and Evolutionary Biology University of California at Irvine.
1992 Postdoctoral Fellow. Dept. of Biology, University of Massachusetts at Amherst.
1992-1996 Postdoctoral Fellow. Dept. of Biology, Emory University.
1996-1999 Postdoctoral Fellow. Theoretical Biology and Biophysics, Los Alamos National Laboratory
1999-2000 Research Assistant Professor, Dept. of Microbiology, University of Washington
2001-2007 Assistant Professor, Dept. of Microbiology, University of Washington
2007- Associate Professor, Dept. of Microbiology, University of Washington

Other Experience and Professional Memberships

1986-1987 University of California Regent's Fellowship.
1993 Genetics Society of America. Travel grant to attend International Congress in Birmingham, England
1994-1996 National Institute of Health. NRSA Postdoctoral Fellowship. Full time salary plus $3,000 per year "institutional allowance"
1996-1998 Los Alamos National Laboratory. Director's Funded Postdoctoral Fellowship. Full time salary plus $15,000 per year for materials and supplies
1999 Foundation for Retrovirology and Human Health. Travel grant to attend Conference on Retroviruses and Opportunistic Infections in Chicago.
2001-2003 New Investigator's Award. Center for AIDS Research, University of Washington. ($50,000)

B. Selected publications (in chronological order).

1. Nelson, P., Mittler, J. E., and Perelson, A. S. 2001. Effect of the eclipse phase of the viral life cycle on estimation of HIV viral dynamic parameters. *JAIDS* **26**:405-412.
2. Nickle, D. C., Learn, G. H., Rain, M. W., Mullins, J. I., and Mittler, J. E. 2002. Curiously modern DNA for a "250 million-year-old" bacterium. *Journal of Molecular Evolution* **54**:134-137.

3. Liu, S-L., Mittler, J. E., Nickle, D. C., Mulvania, T., Shriner, D., Rodrigo, A. G., Kosloff, B., He X., Corey L., and Mullins, J. I. 2002. Selection for human immunodeficiency virus type-1 recombinants in a patient with rapid progression to AIDS. *Journal of Virology* **76**:10674-10684.
4. Nickle, D. C., Jensen, M. A., Shriner D., Brodie S. J., Frenkel, L. M., Mittler, J. E., and Mullins, J. I. 2003. Evolutionary indicators of human immunodeficiency virus type 1 reservoirs and compartments. *Journal of Virology* **77**:5540-5546.
5. Price, M. V. and Mittler, J. E. 2003. Seed-cache exchange promotes coexistence and coupled consumer oscillations: a model of desert rodents as resource processors. *Journal of Theoretical Biology* **223**:215-231.
6. Chang, M., Williams, O., Mittler, J., Quintanilla, A., Carithers, R. L., Perkins, J., Corey, L., and Gretch, D. R. 2003. Dynamics of Hepatitis C Virus Replication in Human Liver**.** *American Journal of Pathology* **163**:433-444.
7. Nickle, D. C., Shriner D., Mittler J. E., Frenkel L. M., and Mullins, J. I. 2003. Importance and detection of virus reservoirs and compartments of HIV infection. *Current Opinion in Microbiology* **6**:410-416.
8. Shriner, D., Shankarappa, R., Jensen, M. A., Nickle, D. C., Mittler, J. E., Margolick, J. B., and Mullins, J.I. 2004. Influence of random genetic drift on HIV-1 *env* evolution during chronic infection. *Genetics* **166**:1155–1164.
9. Wang, K., Samudrala, S., and Mittler J. 2004. Weak agreement between antivirogram and PhenoSense assays in predicting reduced susceptibility to antiretroviral drugs. *Journal of Clinical Microbiology* **42**:2353-2354.
10. Wang, K., Jenwitheesuk, E., Samudrala, S., and Mittler J. E. 2004. Simple linear model provides highly accurate genotypic predictions of HIV-1 drug resistance. *Antiviral Therapy* **9**:343-352.
11. Liu, Y., Nickle, D. C., Shriner, D., Jensen, M. A., Learn, G. H., Mittler, J. E. and Mullins, J. I. Molecular Clock-Like Evolution of Human Immunodeficiency Virus Type 1. *Virology* **329**:101-108.
12. Wang, K., Samudrala, R., and Mittler. J. E. 2004. Antivirogram or PhenoSense: a comparison of their reproducibility and an analysis of their correlation. *Antiviral Therapy* **9**:703–712.
13. Jenwitheesuk, E., Wang, K., Mittler, J. E., and Samudrala, R. 2005. PIRSpred: A web server for reliable HIV-1 protein-inhibitor resistance/susceptibility prediction. *Trends in Microbiology* **13**:150-151
14. Liu, Y., Mullins, J. I., and Mittler, J. E. 2006. Waiting Times for the Appearance of Cytotoxic T-lymphocyte Escape Mutants in Chronic HIV-1 infection. *Virology* **347**:140-146.
15. Wang, K., Mittler, J. E., and Samudrala R. 2006. Comment on evidence for positive epistasis in HIV-1. *Science* **312**:848.
16. Liu, Y., Mullins, J. I., and Mittler, J. E. 2006. Waiting times for the appearance of cytotoxic T-lymphocyte escape mutants in chronic HIV-1 infection. *Virology* **347**:140-146.
17. Price, M. V. and Mittler, J. E. 2006. Cachers, scavengers, and thieves: a novel mechanism for desert rodent coexistence. *American Naturalist* **168**:194–206.
18. McClure, J., van 't Wout, A., Tran, T., and Mittler, J. E. 2007. GM-CSF up-regulates HIV-1 replication in monocyte-derived macrophages cultured at low density. *Journal of Acquired Immune Deficiency Syndrome* (JAIDS) **44**:254-261.
19. Curlin M, Iyer, S., and Mittler, J. E. 2007. Optimal timing and duration of induction therapy for HIV-1 Infection. *PLoS Computational Biology 3:e133.* (18 pages).
20. Curlin, M. E., Wilkin T., and Mittler J. E. 2008. The use of induction-maintenance therapy in HIV-1. *Future HIV Therapy* **2**:175-185.
21. Liu, Y. and Mittler, J. E. 2008. Selection dramatically reduces effective population size in HIV-1 infection. *BMC Evolutionary Biology* BMC **8**:133 (11 pages)
22. Gill, W. P, Harik, N., Whiddon, M., Mittler, J. E., and Sherman D. R. 2009. A replication clock for Mycobacterium tuberculosis. *Nature Medicine* 15:211-214.
23. Haft, R. J. F., Mittler J. E., and Traxler B. 2009. Competition Favors Reduced Parasite Virulence in a Plasmid Model. *ISME Journal* (In Press)

BIOGRAPHICAL SKETCH

NAME Moseley, Stephen L.	POSITION TITLE Professor
eRA COMMONS USER NAME MOSELEY	

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	YEAR(s)	FIELD OF STUDY
University of Dallas, Irving, TX	BA	1973	Biology
Catholic University of America, Washington, DC	MS	1978	Microbiology
University of Washington, Seattle, WA	PhD	1981	Microbiology

A. POSITIONS AND HONORS

1974-1975 Bacteriological Laboratory Technician, Department of Applied Immunology, Walter Reed Army Institute of Research, Washington, D.C.

1975-1977 Microbiologist, Department of Applied Immunology, Walter Reed Army Institute of Research, Washington, D.C.

1977-1981 United States Public Health Service Predoctoral Trainee, Department of Microbiology and Immunology, University of Washington, Seattle, Washington

1981-1982 Postdoctoral Research Affiliate, Department of Medical Microbiology, Stanford University, Stanford, California

1982-1984 Microbiologist, Bacteriological and Mycological Research Laboratory, National Animal Disease Center, Ames, Iowa

1984-1985 Research Associate, Division of Infectious Disease, Children's Orthopedic Hospital and Medical Center, Seattle, Washington

1985-1991 Assistant Professor, Department of Microbiology, Adjunct Assistant Professor, Dept. of Pediatrics, University of Washington, Seattle, Washington

1991-2005 Associate Professor, Department of Microbiology, Adjunct Associate Professor, Dept. of Pediatrics, University of Washington, Seattle, Washington

2005-present Professor, Department of Microbiology, Adjunct Professor, Dept. of Pediatrics, University of Washington, Seattle, Washington

B. SELECTED PEER-REVIEWED PUBLICATIONS (in chronological order)

Guignot, J., Peiffer, I., Bernet-Camard, M.F., Lublin, D.M., Carnoy, C., Moseley, S.L., Servin, A.L. 2000. Recruitment of CD55 and CD66e brush border-associated glycosylphosphatidylinositol-anchored proteins by members of the Afa/Dr diffusely adhering family of *Escherichia coli* that infect the human polarized intestinal Caco-2/TC7 cells. Infect Immun. 68:3554-3563.

Peiffer, I., J. Guignot, A. Barbat, C. Carnoy, S.L. Moseley, B.J. Nowicki, A.L. Servin, and M.-F. Bernet-Camard. 2000. Structural and functional lesions in brush border of human polarized intestinal Caco-2/TC7 cells infected by members of the Afa/Dr diffusely-adhering family of *Escherichia coli.* Infect. Immun. 68:5979-5990.

McVeigh, A., A. Fasano, D.A. Scott, S. Jelacic, S.L. Moseley, D.C. Robertson, and S.J. Savarino. 2000. IS*1414*, an *Escherichia coli* insertion sequence embedded in a transposase-like gene. Infect. Immun. 68:5710-5715.

Loomis, W. P., J. T. Koo, T. P. Cheung and S. L. Moseley. 2001. A tripeptide sequence within the nascent DaaP protein is required for mRNA processing of a fimbrial operon in *Escherichia coli*. Mol. Microbiol. 39:693-708.

Sokurenko, E. V., Tchesnokova, V., Yeung, A. T., Oleykowski, C. A., Trintchina, E., Hughes, K. T., Rashid, R. A., Brint, J. M., Moseley, S. L. and Lory, S. 2001. Detection of simple mutations and polymorphisms in large genomic regions. Nucleic Acids Res. 29(22):E111.

Van Loy, C.P., Sokurenko, E.V. and S.L. Moseley. 2002. The major structural subunits of Dr and F1845 are adhesions. Infect. Immun. 70:1694-1702.

Van Loy, C.P., Sokurenko, E.V., Samudrala, R. and S.L. Moseley. 2002. Identification of amino acids in the Dr adhesin required for binding to decay-accelerating factor. Mol. Microbiol. 45(2):439-452.

S.J. Weissman, S.L. Moseley, D.E. Dykhuizen and E.V. Sokurenko. 2003. Enterobacterial adhesins and the case for studying SNPs in bacteria. Trends Microbiol. 11(3):115-117.

Koo, V.T., J. Choe, and S.L. Moseley. 2004. HrpA, a DEAH-box RNA helicase, is involved in mRNA processing of a fimbrial operon in Escherichia coli. Mol. Microbiol. 52(6):1813-1826.

Selvarangan R, Goluszko P, Singhal J, Carnoy C, Moseley S, Hudson B, Nowicki S, Nowicki B. 2004. Interaction of Dr adhesin with collagen type IV is a critical step in Escherichia coli renal persistence. Infect Immun. 72(8):4827-35.

Rashid RA, Tabata TA, Oatley MJ, Besser TE, Tarr PI, Moseley SL. 1006. Expression of putative virulence factors of *Escherichia coli* O157:H7 differs in bovine and human infections. Infect Immun. 74(7):4142-8.

Korotkova N, Le Trong I, Samudrala R, Korotkov K, Van Loy CP, Bui AL, Moseley SL, Stenkamp RE. 2006. Crystal structure and mutational analysis of the DaaE adhesin of *Escherichia coli*. J Biol Chem. 281(31):22367-77.

Korotkova N, Cota E, Lebedin Y, Monpouet S, Guignot J, Servin AL, Matthews S, Moseley SL. 2006. A Subfamily of Dr Adhesins of *Escherichia coli* Bind Independently to Decay-accelerating Factor and the N-domain of Carcinoembryonic Antigen. J Biol Chem. 281:29120-30.

Rashid RA, Tarr PI, Moseley SL. 2006. Expression of the *Escherichia coli* IrgA homolog adhesin is regulated by the ferric uptake regulation protein. Microb Pathog. 41:207-17.

Korotkova N, Chattopadhyay S, Tabata TA, Beskhlebnaya V, Vigdorovich V, Kaiser BK, Strong RK, Dykhuizen DE, Sokurenko EV, Moseley SL. 2007. Selection for functional diversity drives accumulation of point mutations in Dr adhesins of *Escherichia coli*. Mol. Microbiol. 64:180-94.

Korotkova, N., Y. Yang, I. Le Trong, E. Cota, B. Demeler, J. Marchant, W. E. Thomas, R. E. Stenkamp, S. L. Moseley*, and S. Matthews*. 2008. Binding of Dr adhesins of *Escherichia coli* to carcinoembryonic antigen triggers receptor dissociation. Mol Microbiol 67:420-434. *Co-corresponding authors.

Korotkova N., Y. Yarova-Yarovaya, V. Tchesnokova, N. Yazvenko, M.A. Carl, A.E. Stapleton, and S.L. Moseley. 2008. *E. coli* DraE adhesin – associated bacterial internalization by epithelial cells is independently promoted by decay accelerating factor and CEACAM binding, and does not require the DraD "invasin". Infect Immun. 76:3869-80.

BIOGRAPHICAL SKETCH

NAME Mougous, Joseph	POSITION TITLE Assistant Professor
eRA COMMONS USER NAME MOUGOUS	

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	YEAR(s)	FIELD OF STUDY
Western Washington University, Bellingham, WA	B.S.	1999	Biochemistry
University of California, Berkeley, CA	Ph.D.	2004	Molecular/Cell Biology
Harvard Medical School, Boston, MA		2005-2007	Postdoctoral Research

A. POSITIONS AND HONORS

Positions

1997 – 1999 Western Washington University
Teaching Assistant: General and Analytical Chemistry Laboratory Courses
Advisor: John Weyh

2000 University of California, Berkeley
Graduate Student Instructor: Biochemistry and Molecular Biology Laboratory
Advisor: James Berger

2002 University of California, Berkeley
Graduate Student Instructor: Principles of Biochemistry and Molecular Biology
Advisor: Jeremy Thorner

2005 – 2007 Harvard Medical School
Postdoctoral Research: Investigated a novel protein secretion system in *Pseudomonas aeruginosa*
Advisor: John Mekalanos

2008 – present University of Washington
Assistant Professor: Microbiology Department, School of Medicine

Honors

1998 I.M. Kolthoff Award in Chemistry
1999 Outstanding Chemistry Graduate, WWU
2000 Ford Foundation Predoctoral Fellowship
2002 Keystone Symposia Scholarship
2004 Microbial Pathogenesis Gordon Conference, Best Poster
2005 Damon Runyon Postdoctoral Fellowship
2006 NIGMS Structural Genomics Supplement (Argonne Natl. Lab)

B. SELECTED PEER REVIEWED PUBLICATIONS (in chronological order)

Mougous J.D., Brackley A.J., Foland K., Baker R.T. and Patrick D.L. Formation of uniaxial molecular films by liquid-crystal imprinting in a magnetic field. *Phys. Rev. Lett.* 2000 84(12):2742-5

Mougous J.D., Green R.E., Williams S.J., Brenner S.E. and Bertozzi C.R. Sulfotransferases and sulfatases in mycobacteria. *Chem. Biol.* 2002 9(7):767-76

Williams S.J., Senaratne R.H., Mougous J.D., Riley L.W. and Bertozzi C.R. 5'-adenosinephosphosulfate lies at a metabolic branch point in mycobacteria. *J. Biol. Chem.* 2002 277(36):32606-15

Mougous J.D., Leavell M.D., Senaratne R.H., Leigh C.D., Williams S.J., Riley L.W., Leary J.A. and Bertozzi C.R. Discovery of sulfated metabolites in mycobacteria with a genetic and mass spectrometric approach. *Proc. Natl. Acad. Sci. U.S.A.* 2002 99(26):17037-42

Converse S.E., Mougous J.D., Leavell M.D., Leary J.A., Bertozzi C.R. and Cox J.S. MmpL8 is required for sulfolipid-1 biosynthesis and Mycobacterium tuberculosis virulence. *Proc. Natl. Acad. Sci. U.S.A.* 2003 100(10):6121-6

Pi N., Yu Y., Mougous J.D., and Leary J.A. Observation of a hybrid random ping-pong mechanism of catalysis for NodST: a mass spectrometry approach. *Prot. Sci.* 2004 14(4):903-12

Mougous J.D., Petzold C.J., Senaratne R.H., Lee D.H., Akey D.L., Lin F.L., Munchel S.E., Pratt M.R., Riley L.W., Leary J.A., Berger J.M. and Bertozzi C.R. Identification, function and structure of the mycobacterial sulfotransferase that initiates Sulfolipid-1 biosynthesis. *Nat. Struct. Mol. Biol.* 2004 11(8):721-9

Pi N., Hoang M.B., Gao H., Mougous J.D., Bertozzi C.R., Leary J.A. Kinetic measurements and mechanism determination of Stf0 sulfotransferase using mass spectrometry. *Anal. Biochem.* 2005 341(1):94-104

Mougous J.D., Lee D.H., Hubbard S.C., Schelle M.W., Vocadlo D.J., Berger J.M., Bertozzi C.R. Molecular basis for G protein control of the prokaryotic ATP sulfurylase. *Mol. Cell.* 2006 21(1):109-22

Mougous J.D., Senaratne R.S., Petzold C.J., Jain M., Lee D.H., Schelle M.W., Leavell M.D., Cox J.S., Leary J.A., Riley L.W. and Bertozzi C.R. A novel sulfated metabolite produced by *stf3* negatively regulates the virulence of *Mycobacterium tuberculosis*. *Proc. Natl. Acad. Sci. U.S.A.* 2006 103(11):4258-63

Senaratne R.H., De Silva A.D., Williams S.J., Mougous J.D., Reader J.R., Zhang T., Chan S., Sidders B., Lee D.H., Chan J., Bertozzi C.R., Riley L.W. 5'-Adenosinephosphosulphate reductase (CysH) protects *Mycobacterium tuberculosis* against free radicals during chronic infection phase in mice. *Mol. Microbiol.* 2006 59(6):1744-53.

Mougous J.D., Cuff M.E., Raunser S., Shen A., Zhou M., Gifford C.A., Goodman A.L., Joachimiak G., Ordonez C.L., Lory S., Walz T., Joachimiak A., Mekalanos J.J. A virulence locus of Pseudomonas aeruginonsa encodes a protein secretion apparatus. *Science* 2006 12(5779):1526-30.

Jain M., Petzold C.J., Schelle M.W., Leavell M.D., Mougous J.D., Bertozzi C.R., Leary J.A., Cox J.S. Lipidomics reveals control of *Mycobacterium tuberculosis* virulence lipids via metabolic coupling. *Proc. Natl. Acad. Sci. U.S.A.* 2007 104(12):5133-38.

Senaratne R.H., Mougous J.D., Reader J.R., Williams S.J., Zhang T., Bertozzi C.R., Riley L.W. Vaccine efficacy of an attenuated but persistent *Mycobacterium tuberculosis cysH* mutant. *J. Med. Microbiol.* 2007 56(4):797-803.

Mougous J.D., Gifford C.A., Ramsdell T.L., Mekalanos J.J. Threonine phosphorylation post-translationally regulates protein secretion in *Pseudomonas aeruginosa*. *Nature Cell Biology* 2007 9(7):797-803.

Ballister, E. R., Lai, A.H., Zuckermann, R.N., Cheng, Y. and Mougous, J.D. In Vitro Self-Assembly of Tailorable Nanotubes from a Simple Protein Building Block. *Proc. Natl. Acad. Sci. U.S.A.,* 2008, 105(10): 3733-3738.

BIOGRAPHICAL SKETCH

NAME Mullins, James I.	POSITION TITLE Professor
eRA COMMONS USER NAME imullins	

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing,*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	YEAR(s)	FIELD OF STUDY
University of South Florida, Tampa, FL	BA	1974	Chemistry
University of Minnesota, Twin Cities, MN	PhD	1978	Cell Biology/Biochemistry
California Institute of Technology, Pasadena, CA		1978-1982	Molecular Virology

A. Positions and Honors

Positions and Employment

1978-1982 Research Associate, Department of Chemistry, California Institute of Technology
Visiting Instructor: University of Minnesota, 1979; Cold Spring Harbor Laboratory, 1983-4; International Agency for Research on Cancer, Lyon, 1986-90; Tuyoterveyslaitös Institute for Occupational Health, Helsinki, 1990
1982-1986 Assistant Professor, Harvard University School of Public Health, Dept of Cancer Biology
1987-1989 Associate Professor, Harvard University School of Public Health, Dept of Cancer Biology
1989-1994 Adjunct Professor, Harvard University School of Public Health, Dept of Cancer Biology
1989-1994 Professor, Stanford University School of Medicine, Dept of Microbiology and Immunology
1991-1994 Chair, Stanford University School of Medicine, Dept of Microbiology and Immunology
1994-present Professor, University of Washington School of Medicine: Depts. Microbiology, Medicine, (adjunct) Lab Medicine
1997-2002 Chair, University of Washington School of Medicine, Department of Microbiology

Honors and Awards

1975-1978 Predoctoral Fellowships: Department of Zoology, University of Minnesota; American Cancer Society, Minnesota; NIH-NRSA; Argonne National Lab
1979-1982 Postdoctoral Fellowships: American Cancer Society; NIH-Individual NRSA
1982-1985 American Cancer Society Scholar Award
1985-1990 NIH Research Career Development Award
1986 Massachusetts Governor's Recognition Award for Outstanding Contributions to AIDS Research
2005-present MERIT Award, NIH-NIAID

Selected Professional Service:

Advisor: GerogSpeyerHaus, WHO/UNAIDS Global Network for HIV Isolation & Characterization
Editorial boards: *AIDS, AIDS Res & Human Retroviruses, J. Virology*

B. Selected peer-reviewed publications. *From a total of 284 publications since 1978.* ***A subset of journal publications from 2006-2008 are listed below:***

Holte, S. E., A. J. Melvin, J. I. Mullins and L. M. Frenkel (2006) Density dependent decay in HIV-1 dynamics. **J Acquir Immune Defic Syndr,** 41:266

Liu, Y., J. I. Mullins, and J. E. Mittler. 2006. Waiting times for the appearance of cytotoxic T-lymphocyte escape mutants in chronic HIV-1 infection. **Virology**: 347:140

Frahm, N., P. Kiepiela, S. Adams, C. H. Linde, H. S. Hewitt, K. Sango, M. E. Feeney, M. M. Addo, M. Lichterfeld, M. P. Lahaie, E. Pae, A. G. Wurcel, T. Roach, M. A. St John, M. Altfeld, F. M. Marincola, C. Moore, S. Mallal, M. Carrington, D. Heckerman, T. M. Allen, J. I. Mullins, B. T. Korber, P. J. Goulder, B. D. Walker, and C. Brander. 2006. Control of human immunodeficiency virus replication by cytotoxic T lymphocytes targeting subdominant epitopes. **Nat Immunol** 7:173

Iversen, A. K. N., G. Stewart-Jones, G. H. Learn, N. Christie, C. Sylvester-Hviid, A. E. Armitage, R. Kaul, T. Beattie, J. K. Lee, Y. Li, P. Chotiyarnwong, T. Dong, X. Xu, M. A. Luscher, K. H. MacDonald, H. Ullum, B.

Klarlund-Pedersen, P. Skinhøj, L. Fugger, S. Buus, J. I. Mullins, E. Y. Jones, A. van der Merwe, and A. J. McMichael. 2006. Conflicting selective forces affect CD8+ T-cell receptor contact sites in an HLA-A2 immunodominant HIV epitope**. Nat Immunol** 7:179

Herbeck, J. T., D. C. Nickle, G. H. Learn, G. S. Gottlieb, M. E. Curlin, L. Heath, and J. I. Mullins. 2006. Human Immunodeficiency Virus Type 1 env Evolves toward Ancestral States upon Transmission to a New Host. **J Virol** 80:1637

Rousseau, C., B. A. Birditt, A. R. McKay, J. N. Stoddard, T. C. Lee, S. McLaughlin, S. W. Moore, N. Shindo, G. H. Learn, B. T. Korber, C. Brander, P. J. Goulder, P. Kiepiela, B. D. Walker, and J. I. Mullins. 2006. Large-scale amplification, cloning and sequencing of near full-length HIV-1 subtype C genomes. **J. Virol**. **Methods** 136:11

Shriner, D., Y. Liu, D. C. Nickle, and J. I. Mullins. 2006. Evolution of intrahost HIV-1 genetic diversity during chronic infection. **Int J Org Evolution** 60:1165

Liu, Y., J. McNevin, J. Cao, H. Zhao, I. Genowati, K. Wong, S. McLaughlin, M. McSweyn, K. Diem, C. Stevens, J. Maenza, H. He, D. C. Nickle, D. Shriner, A. C. Collier, L. Corey, M. J. McElrath, and J. I. Mullins. 2006. Selection on the HIV-1 proteome following primary infection. **J. Virol.**:80:9519

Jensen, M. A., M. Coetzer, A. B. van 't Wout, L. Morris, and J. I. Mullins. 2006. A reliable predictor for HIV-1 subtype C based on envelope V3 sequences. **J Virol** 80:4698

Leslie, A., D. A. Price, P. Mkhize, K. Bishop, A. Rathod, C. Day, H. Crawford, I. Honeyborne, T. E. Asher, G. Luzzi, A. Edwards, C. M. Rousseau, J. I. Mullins, G. Tudor-Williams, V. Novelli, C. Brander, D. C. Douek, P. Kiepiela, B. D. Walker, and P. J. Goulder. 2006. Differential selection pressure exerted on HIV by CTL targeting identical epitopes but restricted by distinct HLA alleles from the same HLA supertype. **J Immunol** 177:4699

Bhattacharya, T., M. Daniels, D. Heckerman, B. Foley, N. Frahm, C. Kadie, K. Yusim, B. McMahon, I. James, S. Mallal, J. I. Mullins, D. C. Nickle, J. Herbeck, C. Rousseau, G. H. Learn, T. Miura, C. Brander, B. Walker, and B. Korber. 2007. Founder Effects in Population Based Assessment of HIV Polymorphisms and HLA Allele Associations. **Science** 315:1583

Herbeck, J. T., S. W. Moore, F. Lyagoba, N. Shindo, B. Biryahwaho, P. Kaleebu, and J. I. Mullins. 2007. HIV-1 Subtype Prevalence from 1989-2000 in Women Attending Antenatal Clinics in Uganda. **AIDS Res Hum Retroviruses** 23:755

Nickle, D. C., M. Rolland, S. L. Kosakovsky Pond, W. Deng, M. Seligman, M. A. Jensen, V. Jojic, C. Kadie, D. Heckerman, J. I. Mullins, and N. Jojic. Coping with viral diversity in HIV vaccine design. 2007. **PLoS Comp. Biol**. 3(4):e0754

Rousseau, C. M., G. H. Learn, T. Bhattacharya, D. C. Nickle, D. Heckerman, S. Chetty, C. Brander, P. J. R. Goulder, B. D. Walker, P. Kiepiela, B. T. Korber, and J. I. Mullins. 2007. Extensive intra-subtype recombination in South African human immunodeficiency virus type 1 subtype C infections**. J Virol** 81:4492

Kiepiela, P., K. Ngumbela, C. Thobakgale, D. Ramduth, I. Honeyborne, E. Moodley, S. Reddy, C. de Pierres, Z. Mncube, N. Mkhwanazi, K. Bishop, M. van der Stok, K. Nair, N. Khan, H. Crawford, R. Payne, A. Leslie, J. Prado, A. Prendergast, J. Frater, N. McCarthy, C. Brander, G. H. Learn, D. Nickle, C. Rousseau, H. Coovadia, J. I. Mullins, D. Heckerman, B. D. Walker, and P. Goulder. 2007. CD8+ T-cell responses to different HIV proteins have discordant associations with viral load. **Nature Medicine** 13:46

Nickle, D. C., L. Heath, M. A. Jensen, P. B. Gilbert, J. I. Mullins, and S. L. Kosakovsky Pond (2007) HIV-specific probabilistic models of protein evolution. **PLoS One** 2(6): e503

Honeyborne, I, Prendergast, A, Pereyra, F, Leslie, A, Crawford, H, Payne, R, Reddy, S, Bishop, K, Moodley, E, Nair, K, van der Stok, M, McCarthy, N, Rousseau, CM, Addo, M, Mullins, JI, Brander, C, Kiepiela, P, Walker, BD & Goulder, PJ (2007) Control of human immunodeficiency virus type 1 is associated with HLA-B*13 and targeting of multiple gag-specific CD8+ T-cell epitopes, **J Virol** 81:3667

Crawford, H, Prado, JG, Leslie, A, Hue, S, Honeyborne, I, Reddy, S, van der Stok, M, Mncube, Z, Brander, C, Rousseau, C, Mullins, JI, Kaslow, R, Goepfert, P, Allen, S, Hunter, E, Mulenga, J, Kiepiela, P, Walker, BD & Goulder, PJ (2007) Compensatory Mutation Partially Restores Fitness and Delays Reversion of Escape Mutation within the Immunodominant Hla-B*5703-Restricted Gag Epitope in Chronic Hiv-1 Infection, **J Virol**, May 16 81:8346

Rolland, MA Jensen, DC Nickle, GH Learn, L Heath and JI Mullins. 2007. Reconstruction and function of Ancestral Center-Of-Tree (COT) HIV-I Proteins, **J Virol** 81:8507-14

Rolland, M., D. C. Nickle, W. Deng, N. Frahm, C. Brander, G. H. Learn, D. Heckerman, N. Jojic, V. Jojic, B. D.

Walker, and J. I. Mullins. 2007. Recognition of HIV-1 peptides by host CTL is related to HIV-1 similarity to human proteins. **PLoS ONE** 2:e823

Liu, Y, J. McNevin, Zhao, H, Tebit, DM, McSweyn, M, Ghosh, AK, Shriner, D, Arts, EJ, McElrath, MJ, and Mullins, JI. Evolution of HIV-1 CTL epitopes: Fitness-Balanced Escape **J. Virol** 81:12179

Malhotra, U., F. Li, J. Nolin, M. Allison, H. Zhao, J. I. Mullins, S. Self, and M. J. McElrath. 2007. Enhanced Detection of Human Immunodeficiency Virus Type 1 (HIV-1) Nef-Specific T Cells Recognizing Multiple Variants in Early HIV-1 Infection. **J. Virol** 81:5225

Malhotra, U., J. Nolin, J. I. Mullins, and M. J. McElrath. 2007. Comprehensive epitope analysis of cross-clade Gag-specific T-cell responses in individuals with early HIV-1 infection in the US epidemic. **Vaccine** 25:381

Rolland, M, Nickle, DC & Mullins, JI. 2007. Has HIV-1 lost fitness in humans? **Nature Reviews Microbiology**, 5:1

Rolland, M., Nickle, D.C., and Mullins, J.I. 2007 A new, core elements approach to vaccine immunogen design. **PLoS Pathogens**, 3:e157

Cao, J, McNevin, J, McSweyn, M, Liu, Y, Mullins, JI & McElrath, MJ. 2008. Three amino acid-insertion in a novel Cwl-restricted CTL epitope in HIV-1 p6Pol can mediate immune escape and drug resistance, **J Virol** 82:495

Rolland, M., D. Heckerman, W. Deng, C. Rousseau, H. Coovadia, K. Bishop, P. J. Goulder, B. D. Walker, C. Brander, and J. I. Mullins. 2008. Broad and Gag-biased HIV-1 epitope repertoires are associated with lower viral loads, **PLoS One** 3(1): e1424

Nickle, D. C., N. Jojic, D. Heckerman, V. Jojic, D. Kirovski, M. Rolland, S. Kosakovsky Pond, and J. I. Mullins. 2008. Comparison of immunogen designs that optimize peptide coverage. **PLoS Computational Biology** 4(1): e25 doi:10.1371/journal.pcbi.0040025

J. T. Herbeck, G. S. Gottlieb, Z. Hu, X. Li, R. Detels, J. Phair, C. R. Rinaldo, L. P. Jacobson, J. B. Margolick, and J. I. Mullins, 2008. Lack of Evidence for Changing Virulence of HIV-1 in North America: An Analysis of Greater than 20 Years of Observation in the MACS Cohort, **PLoS One** 3(2): e1525 doi:10.1371/journal.pone.0001525

Gottlieb, G. S., L. Heath, D. C. Nickle, K. C. Wong, S. Leach, B. Jacobs, S. Gezahegne, A. van 't Wout, J. B. Margolick, and J. I. Mullins. 2008. HIV-1 Variation Prior to Seroconversion in Men Who Have Sex with Men: Analysis of Acute/Early HIV Infection in the MACS, **J. Inf. Diseases** 197(7): 1011-5.

Diem, K., D. C. Nickle, A. Motoshige, A. Fox, S. Ross, J. I. Mullins, L. Corey, R. W. Coombs, and J. N. Kreiger. 2008. Male Genital Tract Compartmentalization of Human 1 Immunodeficiency Virus Type 1. **AIDS Res Hum Retroviruses**. 24(4): 561-71

Liu, Y, Curlin, M., Diem, K. Zhao, H., Ghosh, A. K., Zhu, H., Maenza, J., Woodward, A. S., Stevens, C. E., Stekler, S., Collier, A. C., Genowati, I, Deng, W, Zioni, R, Corey, L, Zhu, T, Mullins, J.I. 2008. Env length and N-linked glycosylation following transmission of Human Immunodeficiency Virus Type 1 subtype B viruses. **Virology** 374:229-233.

Rousseau, C. M., Daniels, M. G., Carlson, J., Kadie, C., Crawford, H., Prendergast, A., Matthews, P., Payne, R., Rolland, M., Raugi, D. N., Maust, B. S., Learn, G. H., Nickle, D. C., Coovadia, H., Ndung'u, T., Frahm, N., Brander, C., Walker, B. D., Goulder, P. J. R., Bhattacharya. T., Heckerman, D. E., Korber, B. T., Mullins, J. I. 2008. HLA Class-I Driven Evolution of Human Immunodeficiency Virus Type1 Subtype C: Immune Escape And Viral Load. **J. Virol. EPub** 2008/04/25

BIOGRAPHICAL SKETCH

NAME	POSITION TITLE
Eugene W. Nester	Professor
eRA COMMONS USER NAME (credential, e.g., agency login)	

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

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	YEAR(s)	FIELD OF STUDY
Cornell University	B.S.	1952	Bacteriology
Western Reserve University	PhD	1959	Microbiology
Stanford University,	Postdoc	1959-1962	Genetics

A. POSITIONS AND HONORS

FACULTY POSITIONS

1962-63 Instructor, Departments of Microbiology and Genetics, University of Washington, Seattle
1963-67 Assistant Professor, Departments of Microbiology and Genetics, University of Washington, Seattle
1967-72 Associate Professor, Departments of Microbiology and Genetics, University of Washington, Seattle
1972-82 Professor, Department of Microbiology, University of Washington, Seattle
1981-82 Professor and Acting Chairman, Department of Microbiology and Immunology, University of Washington
1982-97 Professor and Chairman, Department of Microbiology, University of Washington
1988-03 Adjunct Professor, Department of Botany, University of Washington
1997- Professor, Department of Microbiology, University of Washington
2003-08 Adjunct Professor, Department of Biology, University of Washington

HONORARY LECTURESHIPS

1983 Burroughs Wellcome Visiting Professorship in Microbiology, Indiana University
1984 Cydney Thorlton Memorial Lecturer, University of Oklahoma Medical Center, Oklahoma City
1984 Specialist, Chinese University Development Project, Nankai University, Tianjin, Peoples Republic of China
1987 Invited Scholar, U.S.-China Visiting Scholar Exchange Program, National Academy of Sciences
1987 O. N. Allen Lecturer, University of Wisconsin-Madison
1987-8 Foundation Lecturer in Microbiology, American Society for Microbiology
1988 Maurice Ogur Memorial Lecture, Southern Illinois University at Carbondale
1989 Donald M. Nelson Lecturer, University of Missouri-Columbia
1989 John Karling Lecture Series, Purdue University
1993 Pollard Lecturer, Pennysylvania State University
1994-6 Foundation Lecturer in Microbiology, American Society for Microbiology
1998 Richard H. and Elizabeth C. Hageman Distinguished Lectureship in Agricultural Chemistry, Kansas State University, Manhattan
1999 18th Bateson Memorial Lecture, John Innes Institute, Norwich, UK
2003 Keynote speaker, 9th US-Japan Seminar on Plant-Pathogen Interactions
2004 Oliver Smith Memorial Lecture, Marquette University, Milwaukee
2005 Whetzel-Wescott-Dimock Lecture, Cornell University, N.Y.

HONORS

1970-73 Panel Member, Microbiology Section, Office of Naval Research

1972-74	Northwest Branch Counselor
1975-76	Panel member, Microbiology Section, Office of Naval Research
1977-80	Chair, Microbial Genetics Study Group for "Topic Outlines," a project sponsored by ASM
1982-84	Member, NIH Study Section (Microbial Genetics)
1983	Burroughs-Wellcome Visiting Professorship
1984	Specialist, Chinese University Development Project, Nankai University, Tianjin, Peoples Republic of China
1984-86	Chair, NIH Study Section (Microbial Genetics)
1986-87	Member, Carski Award Committee, American Society for Microbiology
1986-87	Chair, Division of Genetics and Molecular Biology, American Society for Microbiology
1987-88	Chair, Carski Award Committee, American Society for Microbiology
1988-89	ERGO, Steering Committee for Scientific Evaluation of the Introduction of Genetically Modified Microorganisms and Plants into the Environment - National Academy of Sciences
1990	Inaugural Recipient, The Australia Prize
1987-88	Chair, Carski Award Committee, American Society for Microbiology
1988-89	ERGO, Steering Committee for Scientific Evaluation of the Introduction of Genetically Modified Microorganisms and Plants into the Environment - National Academy of Sciences
1990-92	Treasurer, International Society for Molecular Plant-Microbe Interactions
1991	Cetus Award in Biotechnology
1991-92	President, American Society for Microbiology, Northwest Branch
1992	Chair, Organizing Committee, Sixth International Symposium on the Molecular Genetics of Plant-Microbe Interactions, July 11-16, 1992
1992-96	American Academy of Microbiology, Microbiological Research for the Future Steering Committee
1993	Fellow, American Academy of Microbiology
1994	Member, National Academy of Sciences
1994	Fellow, American Association for the Advancement of Science
1994-96	President, International Society for Molecular Plant-Microbe Interactions
1994-00	Member, Board of Governors, American Academy of Microbiology
1995	Foreign Fellow, National Academy of Sciences, India
1999-05	Member of Council Policy Committee of ASM
1999-05	Chairman, Board of Governors, American Academy of Microbiology
2002	Chair of organizing committee for AAM for a Colloquium on 100 years of Bt: A Paradigm on Transgenic Organisms
2002-03	Member of Study Group of National Research Council to draft a report on Biocontainment of Transgenic Organisms
2004-2007	Secretary, Class VI, National Academy of Sciences
2006-09	Member at Large, AAAS

B. PUBLICATIONS (selected from 234 peer-reviewed publications)

- Lee, Y.-W., Jin, S., Sim, W.-S., and Nester, E.W. 1995. Genetic Evidence for Direct Sensing of Phenolic Compounds by the VirA Protein of *Agrobacterium tumefaciens.* PNAS 92:12245-12249.
- Doty, S.L., Yu, C.M., Lundin, J.I., Heath, J.D., and Nester, E.W. 1996. Mutational Analysis of the Input Domain of the VirA Protein of *Agrobacterium tumefaciens.* J. Bacteriol. 178:961-970.
- Piers, K.L., Heath, J.D., Liang, S., Stephens, K.M., and Nester, E.W. 1996. *Agrobacterium tumefaciens*-mediated Transformation of Yeast. PNAS 93:1613-1618.
- Fullner, K.J. and Nester, E.W. 1996. Temperature Affects the T-DNA Transfer Machinery of *Agrobacterium tumefaciens*. J. Bacteriol. 178:1498-1504.
- Fullner, K.J., Lara, J.C., and Nester, E.W. 1996. Pilus Assembly by *Agrobacterium* T-DNA Transfer Genes. Science 273:1107-1109.
- Mushegian, A.R., Fullner, K.J., Koonin, E.V., and Nester, E.W. 1996. A Family of Lysozyme-like Virulence factors in Bacterial Pathogens of Plants and Animals. PNAS 93:7321-7326.
- Nester, E., Lee, Y.-W., Jin, S, and Sim, W.-S. 1996. The Sensing of Plant Signal Molecules by *Agrobacterium*. Gene.

- Doty, S.L., Heath, J.D., and Nester, E.W. 1996. Signal Detection by VirA. In: Ream, W. and Gelvin, S.B. (eds) Crown Gall Advances in Understanding Interkingdom Gene Transfer, APS Press, St. Paul, MN pp 1-14.
- Fullner, K.J. and Nester, E.W. 1996. Environmental and Genetic Factors Affecting RSF1010 Mobilization between Strains of *Agrobacterium tumefaciens*. In: Ream, W. and Gelvin, S.B. (eds) Crown Gall Advances in Understanding Interkingdom Gene Transfer, APS Press, St. Paul, MN, pp 15-29.
- Heath, J.D., Boulton, M.I., Raineri, D.M., Doty, S.L., Mushegian, A.R., Charles, T.C., Davies, J.W., and E.W. Nester. 1997. Discrete Regions of the Sensor Protein VirA Determine the Strain-Specific Ability of *Agrobacterium* to Agroinfect Maize. MPMI 10:221-227.
- Belanger, C., Loubens, I., Nester, E. 1997. Variable Efficiency of a Ti Plasmid-Encoded VirA Protein in Different Agrobacterial Hosts. J. Bacteriol. 179:2305-2313.
- Kemner, J.M., Liang, X., and Nester, E.W. 1997. The *Agrobacterium tumefaciens* Virulence Gene *chvE* Is Part of a Putative ABC-Type Sugar Transport Operon. J. Bacteriol. 179:2452-2458.
- Lee, Y-W, Ha, U-H, Sim, W-S, and Nester, E.W. 1998. Characterization of an unusual sensor gene (*virA*) of *Agrobacterium.* Gene 210: 307-314.
- Deng, W., Chen, L., Wood, D.W., Metcalfe, T., Liang, X., Gordon, M.P., Comai, L. and Nester, E.W. 1998. *Agrobacterium* VirD2 protein interacts with plant host cyclophilins. PNAS 95:7040-7045.
- Peng, W.T., Lee, Y.W. and Nester, E.W. 1998. The phenolic recognition profiles of the *Agrobacterium tumefaciens* VirA protein are broadened by a high level of the sugar binding protein ChvE. J. Bacteriol. 180:5632-5638.
- Deng, W., Chen, L., Peng, W-T, Liang, X., Sekuguchi, S., Gordon, M.P., Comai, L., and Nester, E.W. 1999. VirE1 is a specific molecular chaperone for the exported single-stranded-DNA-binding protein VirE2 in *Agrobacterium*. Mol. Microbiol. 31: 1795-1807.
- Chen, L, Li, C.M., and Nester, E.W. 2000. T-DNA associated proteins of *Agrobacterium tumefaciens* are exported independently of the *virB* secretion system. PNAS 97(13):7545-7550.
- Kelman, A., Sequeira, L. and Nester, E.W. 2000. Early germinative ideas on the origins of infectious disease [letter; comment]. Science 298(5485):1689-1691.
- Nester, E.W. 2000. DNA and protein transfer from bacteria to eukaryotes - the *Agrobacterium* story. Mol. Plant Path. 1:87-90.
- Peng, W-T., Banta, L.M., Charles, T.C., and Nester, E.W. 2001. The *chvH* locus of *Agrobacterium* encodes a homolog of an elongation factor involved in protein synthesis. J. Bacteriol. 183(1):36-45.
- Peng W. and Nester, E.W. 2001. Characterization of a putative RND-type efflux system in *Agrobacterium tumefaciens*. Gene. 270(1-2):245-252.
- Ditt R., Nester E.W. and Comai L. 2001. Plant gene expression responses to *Agrobacterium tumefaciens*. PNAS 98(19):10954-10959.
- Wood, D. et al. 2001. The genome of the natural genetic engineer *Agrobacterium tumefaciens* C58. Science 294(5550):2317-2323.
- Pantoja, M., Chen, L, Chen, Y. and Nester, E.W. 2002. *Agrobacterium* type IV secretion is a two-step process in which export substrates associate with the virulence protein VirJ in the periplasm. Mol. Micro. 45(5):1325-1335..
- Chen, L., Chen, Y., Wood, D.W. and Nester, E.W. 2002. A New Type IV Secretion System Promotes Conjugal Transfer in *Agrobacterium tumefaciens*. J. Bact. 184(17):4838-4845.
- Li, L., Jia, Y., Hori, Q., Charles, T.C., Nester, E.W. and Pan, S. 2002. A Global pH sensor: *Agrobacterium* sensor protein Chv G regulates acid-inducible genes on its two chromosomes and Ti plasmid. PNAS USA 99:12369-12374.
- Roberts, R., Metz, M., Monks, D., Lockwood-Mullaney, M., Hall, T. and Nester, E.W. 2003. Purine Synthesis and increased *Agrobacterium tumefaciens* transformation of yeast and plants. PNAS USA. 100(11):6634-6639.
- Nester, E., Wood, D. and P. Liu. 2004. Global Analysis of *Agrobacterium*-Plant Interactions. Presented at 9th Japan-US Seminar on Plant-Pathogen Interactions. APS Press, St. Paul, MN. In Press.
- De Figueiredo, P., Roberts, R.L. and Nester E.W. 2004. DARTS: a DNA-based *In Vitro* Polypeptide Display Technology. Proteomics.4:3128-3140.
- Suksomtip, M., Liu, P., Wood, D. and Nester, E.W. 2005. Citrate Synthase Mutants of *Agrobacterium* are attenuated in virulence and display reduced vir gene induction. J. Bact. 187 (14): 4844 – 4852.

- Liu, P., Wood, D.W., and Nester, E. W. 2005. Phosphoenolpyruvate carboxykinase is an acid induced, chromosomally encoded, virulence factor in *Agrobacterium tumefaciens*. J. Bact. 187 (17): 6039 – 6045.
- Ditt, R.F, Nester, E.W. and Comai, L. 2005. The plant cell defense and *Agrobacterium tumefaciens*. FEMS Microbiology Letters 247:207-213.
- Liu, P. and Nester, E.W. 2006. Indoleacetic acid, a product of transferred DNA, inhibits *vir* gene expression and growth of *Agrobacterium tumefaciens* C58. PNAS 103:4658-4662.
- Ditt R.F., Kerr K. F., de Figueiredo, P., Delrow, J., Comai, L. and Nester E.W. 2006. The *Arabidopsis thaliana* Transcriptome in Response to *Agrobacterium tumefaciens.* Mol Plant Microbe Interact. 19 (6): 665-81.
- de Figueiredo P, Terra B, Anand JK, Hikita T, Sadilek M, Monks DE, Lenskiy A, Hakomori S, Nester EW. A catalytic carbohydrate contributes to bacterial antibiotic resistance. Extremophiles. 2007 Jan;11(1):133-43.
- Yuan, Z.C., Edlind, M.P., Liu, P., Saenkham, P., Banta, L.M., Wise, A.A., Ronzone, E., Binns, A.N., Kerr, K., Nester, E.W. 2007. The plant signal salicylic acid shuts down expression of the *vir* regulon and activates quormone-quenching genes in *Agrobacterium.* Proc Natl Acad Sci USA 104: 1179-11795.
- Yuan, Z.C., Liu, P., Saenkham, P., Kerr, K. and E.W. Nester. 2008. Transcriptome profiling and functional analysis of *Agrobacterium tumefaciens* reveals a general conserved response to acidic conditions (pH 5.5) and a complex acid-mediated signaling involved in *Agrobacterium*-plant interactions. J. Bacteriol. 190: 494-507.
- Yuan, Z.C., Haudecoeur, E., Faure, D., Kerr, K., and Nester, E.W. 2008 Comparative transcriptome analysis of Agrobacterium tumefaciens in response to plant signal salicylic acid, indole -3- acetic acid and α -amino butyric acid reveals signaling cross-talk and *Agrobacterium*-plant co-evolution. Cellular Microbiol. 10:2339-2554
- Pruss, G.J., Nester, E.W. and Vance, V. 2008 Infiltration with *Agrobacterium tumefaciens* induces host defense and development-dependent responses in the infiltrated zone. 21:1528-1538.

BIOGRAPHICAL SKETCH

NAME Parsek, Matthew R.	POSITION TITLE Associate Professor
eRA COMMONS USER NAME PARSEK	

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	YEAR(s)	FIELD OF STUDY
University of Illinois at Urbana Champaign	B.S.	1989	Biology
University of Illinois at Chicago	Ph.D.	1995	Microbiology
University of Iowa, Iowa City		1999	Microbiology

A. POSITIONS AND HONORS

ACADEMIC APPOINTEMNTS AND RESEARCH EXPERIENCE

1999-2003 Assistant Professor Department of Civil and Environmental Engineering, Northwestern University, Evanston, IL

2001-2003 Assistant Professor Department of Microbiology and Immunology, (secondary appt) Northwestern University, Evanston, IL

2003-2005 Assistant Professor Department of Microbiology University of Iowa

2005-2006 Associate Professor Department of Microbiology University of Iowa

2006-present Associate Professor Department of Microbiology University of Washington

2000-2004 Editorial Board *Applied and Environmental Microbiology.*

2004-2009 Cover Editor *Applied and Environmental Microbiology.*

2004-present Editorial Board *Biofilms*

2000-2003 *Ad hoc* reviewer for NIH study sections (BM1, BM2 and SSS-K study sections)

2002-2006 Panelist for NSF (MCB-Signal Transduction)

Ad hoc reviewer for *Molecular Microbiology*, *Journal of Bacteriology*, *Infection and Immunity, Environmental Science and Technology, FEMS Microbiology letters, Microbiology, Biotechnology and Bioengineering*, *PNAS, Nature, Nature reviews,* and *Biotechniques*.

HONORS AND AWARDS

B. SELECTED PEER REVIEWED PUBLICATIONS (in chronological order)

Parsek, M.R., and P.K. Singh. 2003. Bacterial Biofilms: an emerging link to pathogenesis. Ann. Rev. Microbiol., **33:**21-31.

Chopp, D., Kirisits, M.J., Moran, B. and **M.R. Parsek.** 2003. Dependence of quorum sensing on the depth of a growing biofilm. Bull. Math. Biol., 2003 **65**:1053-79.

Teitzel, G.M. and **M.R. Parsek**. 2003. Resistance of biofilm and planktonic *P. aeruginosa* to heavy metals. Appl. Env. Microbiol., **69:**2313-20.

Wozniak, D.J., T.J.O. Wyckoff, M. Starkey, P. Azadi, G.A. O'Toole, and **M.R. Parsek.** 2003. Alginate is not a significant component of the extracellular polysaccharide matrix of PA14 and PAO1 *Pseudomonas aeruginosa* biofilms., Proc. Natl. Acad. Sci. USA, **100**:7907-12.

Jackson, K.D., Starkey, M., **Parsek, M.R.**, and D.J. Wozniak. 2004. Identification of *psl*, a locus encoding a potential exopolysaccharide that is essential for *Pseudomonas aeruginosa* biofilm initiation. J. Bacteriol., **186**:4466-75.

Danhorn, T., Hentzer, M., **Parsek, M.R.** and C. Fuqua. 2004. Phosphorous limitation enhances biofilm formation of the plant pathogen *Agrobacterium tumefaciens* through the PhoR-PhoB regulatory system. J. Bacteriol., **186**:4492-501.

Parsek, M.R. and C. Fuqua. 2004. Biofilms 2003: Emerging themes and challenges in the study of surface-associated microbial life. J. Bacteriol., **186:**4427-40.

Parsek M.R. and E.P. Greenberg. 2005. Sociomicrobiology: the connections between quorum sensing and biofilms. Trends Microbiol. **13:**27-33.

Kirisits MJ, Prost L, Starkey M, **M.R. Parsek**. Characterization of Colony Morphology Variants Isolated from *Pseudomonas aeruginosa* Biofilms. Appl. Env. Microbiol., **71:**4809-4821.

Landry, R.L., Hupp, J.S., Singh, P.K., and **M.R. Parsek.** 2006. Mucin-*Pseudomonas aeruginosa* interactions promote biofilm formation and antibiotic resistance., Mol. Microbiol., **59**:142-51.

An, D., Danhorn, T., Fuqua, C., and **M.R. Parsek.** 2006. Quorum sensing and motility mediate interactions between *Pseudomonas aeruginosa* and *Agrobacterium tumefaciens* in biofilm cocultures. Proc. Natl. Acad. Sci. USA, **103**:3828

Kirisits, M. J. and **M.R. Parsek.** Does *Pseudomonas aeruginosa* use intercellular signalling to build biofilm communities? 2006 Cell Microbiol. Dec;8(12):1841-9.

Shrout, J.S., Chopp, D.L., Just, C.L., Hentzer, M., Givskov, M., and **M.R. Parsek.** 2006. The impact of Quorum Sensing and Swarming Motility to *Pseudomonas aeruginosa* biofilm formation is nutritionally conditional., Mol. Microbiol., **62:**1264-77.

Ma L, Jackson KD, Landry RM, **Parsek MR**, Wozniak DJ. 2006. Analysis of *Pseudomonas aeruginosa* conditional psl variants reveals roles for the psl polysaccharide in adhesion and maintaining biofilm structure postattachment. J Bacteriol **188:**8213-8221.

Teitzel GM, Geddie A. De Long SK, Kiristis MJ, Whiteley M, **Parsek MR**. 2006. Survival and growth in the presence of elevated copper: transcriptional profiling of copper-stressed *Pseudomonas aeruginosa*. J Bacteriol 188:7242-7256.

Stoltz, D.A., Ozer, E.A., Ng, C.J., Yu, J.M., Reddy, S.T., Lusis, A.J., Bourquard, N., Parsek, M.R., Zabner, J., Shih, D.M. 2007. Paraoxonase-2 deficiency enhances Pseudomonas aeruginosa quorum sensing in murine tracheal epithelia. Am J Physiol Lung Cell Mol Physiol. 292: epub2006 Nov 22.

Horswill AR, Stoodley P, Stewart PS, **Parsek MR**. 2007. The effect of the chemical, biological and physical environment on quorum sensing in structured microbial communities. Anal Bioanal Chem 387: 371-380.

An D, **Parsek MR**. 2007. The promise and peril of transcriptional profiling in biofilm communities. Curr Opin MIcrobiol 10:292-296.

Ma L, Lu H, Sprinkle A, **Parsek MR**, Wozniak DJ. 2007. Pseudomonas aeruginosa Psl is a galactose- and mannose-rich exopolysaccharide. J Bacteriol 189: 8353-8356.

Kiristis MJ, Margolis JJ, Purevdori-Gage BL, Vaughn B, Chopp DL, Stoodley P, **Parsek MR**. 2007. Influence of the hydrodynamic environment on quorum sensing in *Pseudomonas aeruginosa* biofilms. J Bacteriol 189: 8357 – 8360.

Starner TD, Shrout JD, **Parsek MR**, Applebaum PC, Kim G. 2008. Subinhibitory concentrations of azithromycin decrease nontypeable *Haemophilus influenzae* biofilm formation and diminish established biofilms. Antimicrob Agents Chemother 52: 137-145.

BIOGRAPHICAL SKETCH

NAME OF SPONSOR (CO-SPONSOR) Lalita Ramakrishnan	POSITION TITLE Associate Professor of Microbiology and Medicine and Adjunct Associate Professor of Immunology
eRA COMMONS USER NAME lalitar	

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

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	YEAR(s)	FIELD OF STUDY
Baroda Medical College, Baroda, India (Baroda, is now known as Vadodara)	M B,BS	1983	Medicine (MD Equivalent)
Tufts University School of Medicine, Boston, MA	PhD	1990	Immunology *Mentor: Dr. Naomi Rosenberg*
New England Medical Center, Boston, MA	Residency	1988-1991	Medicine *Department Chair: Dr. Sheldon M. Wolff*
University of California, San Francisco, CA	Clinical fellowship	1991-1992	Infectious Diseases *Division Chief: Dr. Richard M. Locksley*
Stanford University, Stanford, CA	Postdoctoral fellowship	1992-1998	Microbiology & Immunology *Mentor: Dr. Stanley Falkow*

A. **Positions and Honors**

Positions Held

2007- Associate Professor of Microbiology and Medicine, Adjunct Associate Professor of Immunology, University of Washington, Seattle, WA

2006-2007 Associate Professor of Microbiology, Adjunct Associate Professor of Medicine and Immunology, University of Washington, Seattle, WA

2005-2006 Adjunct Assistant Professor, Department of Immunology, University of Washington, Seattle, WA

2004- Attending Physician, Infectious Diseases Consultation Services, University of Washington Medical Center *(Two to four weeks per year involving ~75% of my time for those weeks)*

2001-2005 Assistant Professor, Department of Microbiology and Adjunct Assistant Professor, Department of Medicine, University of Washington, Seattle, WA

1998-2000 Senior Research Scientist, Department of Microbiology and Immunology, Stanford University School of Medicine, Stanford, CA

1998-2000 Consulting Physician in Infectious Diseases, Palo Alto Veterans Medical Center, Palo Alto, CA (*Served as attending physician for four weeks per year involving ~ 50% of my time for those weeks*)

1992-1998 Associate Physician, Medicine - Emergency Services, San Francisco General Hospital, San Francisco, CA (*Served as Attending Physician for eight hours every two weeks during my postdoctoral fellowship*)

Clinical Certification and Licensure

1991	Board Certified in Internal Medicine
1994	Board Certified in Infectious Diseases (Recertified 2005)
2001-	Medical Licensure in Washington

Honors and Awards

2006	Society for Leukocyte Biology, G. Jeanette Thorbecke Award
2006	Member of Faculty of 1000
2005	Burroughs Wellcome Pathogenesis of Infectious Diseases Award
2004	Sackler Science Frontier Series Lectureship, Tufts University School of Medicine, Boston
2004	University of Washington Science in Medicine New Investigator Lectureship
2003	Puget Sound Partners in Global Health Award
2001	Ellison Medical Foundation New Scholar in Global Infectious Diseases Award
1996	Mentored Clinical Scientist Development Award (KO8)
1992	Howard Hughes Medical Institute Physician Postdoctoral Fellowship Award
1987	Charlton Student Research Scientist Award, Tufts Medical School
1983	First Class (Honors) Graduate, Baroda Medical College
1975	National Merit Scholar

Editorial Boards

2001-	Editorial Board, *Infection and Immunity*
2005-	Associate Editor, *PLoS Pathogens*
2004-	Consulting Academic Editor, *PLoS Biology*
2004-	Consulting Academic Editor, *PLoS Medicine*

Advisory Panels and Grant Reviews

2004-2007	Member Advisory Panel for Johns Hopkins University/NIH contract on "Animal Models of Tuberculosis"
2006-	Reviewer for Puget Sound Partners in Global Health Pilot Project Proposals
2004	Reviewer for Howard Hughes Medical Institute's International Competition in Infectious Diseases and Parasitology.
2004	Expert Reviewer for NIH Special Emphasis Panel on Innate Immunity
2003	Ad Hoc member of Bacteriology and Mycology NIH study section (BM1) Special Emphasis Panel for tuberculosis
2003	Reviewer for Wellcome Trust Grant application
2002	Reviewer for merit review application, VA Medical Research Service, Department of Veterans Affairs
2002	Reviewer for Royalty Research Fund, University of Washington
2001	Member of the NIAID, NIH Special Emphasis Panel for RFA AI-01-009 “Overcoming the Tuberculosis Latency Challenge”
2001-2007	Reviewer for research grant applications for the Netherlands Organization of Scientific Research.

B. Peer-Reviewed Publications

L. Ramakrishnan, N. Federspiel and S. Falkow. 2000. Granuloma-specific expression of *Mycobacterium* virulence proteins from the glycine-rich PE-PGRS family. *Science* 288:1436-1439.

D.M. Bouley, N. Ghori, K.L. Mercer, S. Falkow and L. Ramakrishnan. 2001. The dynamic nature of the host-pathogen interactions in *Mycobacterium marinum* granulomas. *Infect Immun* 69: 7820-7831.

K. Chan, T. Knaak, L. Satkamp, O.Humbert, S. Falkow and L. Ramakrishnan. 2002. Complex pattern of *Mycobacterium marinum* gene expression during long-term granulomatous infection. *Proc Natl Acad Sci USA* 99:3920-3925.

J.M. Davis, H. Clay, J.L. Lewis, N. Ghori, P. Herbomel and L. Ramakrishnan. 2002. Real-time visualization of *Mycobacterium*-macrophage interactions leading to initiation of granuloma formation in zebrafish embryos. *Immunity* 17:693-702.

C.L. Cosma, O. Humbert, and L. Ramakrishnan. 2004. Superinfecting mycobacteria home to established tuberculous granulomas. *Nat Immunol* 5:828-35.

H.E. Volkman, H. Clay, D. Beery, J.C Chang, D. R. Sherman, and L. Ramakrishnan. 2004. Tuberculous granuloma formation is enhanced by a mycobacterium virulence determinant. *PLoS Biol* 2:1946-1956.

H. Clay and L. Ramakrishnan. 2005. Multiplex fluorescent in situ hybridization in zebrafish embryos using tyramide signal amplification. *Zebrafish 2*:105-111.

C. L. Cosma, K. Klein, R. Kim, D. Beery, and L. Ramakrishnan. 2006 *Mycobacterium marinum* Erp is a virulence determinant required for cell wall integrity and intracellular survival. *Infect Immun* 74:3125-3133.

L.E. Swaim, L.E. Connolly, H.E. Volkman, O. Humbert, D. E. Born, and L. Ramakrishnan. 2006. *Mycobacterium marinum* infection of adult zebrafish produces caseating granulomatous tuberculosis and is moderated by adaptive immunity. *Infect Immun* 74:6108-17.

L. E. Connolly, P.H. Edelstein and L. Ramakrishnan. 2007. Why is long-term drug treatment needed to cure tuberculosis? *PLoS Medicine* 4:e120. *Research in Translation Article*

H. Clay, J.M. Davis, D. Beery, A. Huttenlocher, S. E. Lyons and L. Ramakrishnan. 2007. Dichotomous role of the macrophage in early *Mycobacterium marinum* infection of the zebrafish. *Cell Host and Microbe* 2:29-39..

T.P. Stinear, T. Seemann, P.F. Harrison, G.A. Jenkin, J.K. Davies, P.D.R. Johnson, Z. Abdellah, C. Arrowsmith, T. Chillingworth, C. Churcher, K. Clarke, A. Cronin, P. Davis, I. Goodhead N. Holroyd, K. Jagels, A. Lord, S. Moule, K. Mungall, H. Norbertczak, M.A. Quail, E. Rabbinowitsch, D. Walker, B. White, S. Whitehead, P.L.C. Small, R. Brosch, L. Ramakrishnan, M.A. Fischbach, J. Parkhill and S.T. Cole 2008. Insights from the complete genome sequence of *Mycobacterium marinum* on the evolution of *Mycobacterium tuberculosis*. *Genome Res*, in press.

BIOGRAPHICAL SKETCH

NAME	POSITION TITLE
Samudrala, Vaikuntanath V. (Ram)	Associate Professor
eRA COMMONS USER NAME (credential, e.g., agency login)	

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	YEAR(s)	FIELD OF STUDY
Ohio Wesleyan University, Delaware, OH	BA	1993	Comp Sci/Genetics
CARB, Rockville, MD	PhD	1997	Computational Biology
Stanford University, Stanford, CA	Postdoc	2000	Computational Biology

A. POSITIONS AND HONORS

Spring 1992	Howard Hughes Research Intern at USDA Laboratories, Delaware, Ohio
Summer 1992	Howard Hughes Research Intern at East Carolina University School of Medicine
1993-1997	Graduate Fellow at the Center for Advanced Research in Biotechnology (CARB)
1997-2001	Postdoctoral Fellow at Stanford University School of Medicine
2001-2006	Assistant Professor in Computational Genomics, Department of Microbiology, University of Washington, Seattle
2006-	Associate Professor in Computational Genomics, Department of Microbiology, University of Washington, Seattle

HONORS AND AWARDS

1992	Howard Hughes Internship Award
1993	Zain-ul-Abedin Memorial Scholarship for Outstanding Graduate Studies
1993-1997	CARB Life Technologies Graduate Fellowship
1997-2001	PMMB/Burroughs-Wellcome Postdoctoral Fellowship
2002-2005	Searle Scholar
2003	Named one of the world's top young innovators by MIT Technology Review
2004	UW New Investigator Science in Medicine Lecture
2005-2010	NSF CAREER Award
2006	NIH Director's Pioneer Award Finalist (25/465 applicants selected as finalists)
2008	Honorary diplomas from the cities of Caspa and Yautan, Peru; Official Decree of Thanks from the Peruvian Minister of Health
2008	Alberta Heritage Foundation for Medical Research Visiting Scientist Award

B. PEER REVIWED PUBLICATIONS

Liu T, Horst J, Samudrala R. A novel method for predicting and using distance constraints of high accuracy for refining structure prediction. Proteins: Structure, Function, and Bioinformatics 2008. In press.

Bernard B, Samudrala R. A generalized knowledge-based discriminatory function for biomolecular interactions. Proteins: Structure, Function, and Bioinformatics 2008. in press.

Samudrala R, Heffron F, McDermott J. In silico identification of secreted effectors in Salmonella typhimurium. PLoS Pathogens 2008. accepted .

Ngan S-C, Samudrala R. A sequence-space scoring function for de novo protein structure prediction. Protein Engineering, Design and Selection 2008. accepted .

McDermott J, Ireton R, Montgomery K, Bumgarner R, Samudrala R (editors). Computational systems biology. Methods in Molecular Biology , Humana Press 2008. in press.

Frazier Z, McDermott J, Samudrala R. Computational representation of biological systems. Methods in Molecular Biology 2008. in press.

Guerquin M, McDermott J, Samudrala R. The Bioverse API and Web Application. Methods in Molecular Biology 2008. in press.

Rashid I, McDermott J, Samudrala R. Inferring molecular interaction pathways from eQTL data. Methods in Molecular Biology 2008. in press.

Wichadakul D, McDermott J, Samudrala R. Prediction and integration of regulatory and protein-protein interactions. Methods in Molecular Biology 2008. in press.

McDermott J, Wang J, Yu J, Wong GSK, Samudrala R. Prediction and annotation of plant protein interaction networks. Genomics & Bioinformatics in Plant Biotechnology 2008. in press.

Wang K, Horst J, Cheng G, Nickle D, Samudrala R. Protein meta-functional signatures from combining sequence, structure, evolution and amino acid property information. PLoS Computational Biology 4: e1000181, 2008.

Samudrala R, Oren EE, Cheng C, Horst, J, Bernard B, Gungormus M, Hnilova M, Fong H, Tamerler C, Sarikaya M. Knowledge-based design of inorganic binding peptides. Proceedings of the conference on the Foundations of Nanoscience: Self-Assembled Architectures and Devices, 2008.

Evans JS, Samudrala R, Walsh TR, Oren EE, Tamerler C. Molecular design of inorganic binding polypeptides. MRS Bulletin 33: 514-518 2008. (Accompanying introductory article with biographies, pages 504-512.)

Liu T, Guerquin M, Samudrala R. Improving the accuracy of template-based predictions by mixing and matching between initial models. BMC Structural Biology 8: 24, 2008.

Jenkins C, Samudrala R, Geary S, Djordjevic SP. Structural and functional characterisation of an organic hydroperoxide resistance (Ohr) protein from Mycoplasma gallisepticum. Journal of Bacteriology 190: 2206-2208, 2008.

Jenwitheesuk E, Rivas K, Van Voorhis WV, Samudrala R. Novel paradigms for drug discovery: Computational multitarget screening. Trends in Pharmacological Sciences 29: 62-71, 2008.

Ngan S-C, Hung L-H, Liu T, Samudrala R. Scoring functions for de novo protein structure prediction revisited. Methods in Molecular Biology 413: 243-282, 2007.

Oren EE, Tamerler C, Sahin D, Hnilova M, Seker UOS, Sarikaya M, Samudrala R. A novel knowledge-based approach for designing inorganic binding peptides. Bioinformatics 23: 2816-2822, 2007.

Jenwitheesuk E, Samudrala R. Identification of potential HIV-1 targets of minocycline. Bioinformatics 23: 2797-2799, 2007.

Chevance FFV, Takahashi N, Karlinsey JE, Gnerer J, Hirano T, Samudrala R, Aizawa S-I, Hughes KT. The mechanism of outer membrane penetration by the eubacterial flagellum and implications for spirochete evolution. Genes and Development 21: 2326-2335, 2007.

McDermott J, Samudrala R. Bioinformatic characterization of plant networks. Proceedings of the Asia Pacific Conference on Plant Tissue Culture and Agrobiotechnology , 2007.

Bockhorst J, Lu F, Janes JH, Keebler J, Gamain B, Awadalla P, Su X, Samudrala R, Jojic N, Smith JD. Structural polymorphism and diversifying selection on the pregnancy malaria vaccine candidate VAR2CSA. Molecular and Biochemical Parasitology 155: 103-112, 2007.

Berube PM, Samudrala R, Stahl DA. Transcription of amoC is associated with the recovery of Nitrosomonas europaea from ammonia starvation. Journal of Bacteriology 89: 3935-3944, 2007.

Hung L-H, Ngan S-C, Samudrala R. De novo protein structure prediction. In Xu Y, Xu D, Liang J, editors. Computational Methods for Protein Structure Prediction and Modeling 2: 43-64, 2007.

Hung L-H, Samudrala R. An automated assignment-free Bayesian approach for accurately identifying proton contacts from NOESY data. Journal of Biomolecular NMR 36: 189-198, 2006.

Wang K, Samudrala R. Incorporating background frequency improves entropy-based residue conservation measures BMC Bioinformatics 7: 385, 2006.

Liu T, Samudrala R. The effect of experimental resolution on the performance of knowledge-based discriminator y functions for protein structure selection. Protein Engineering, Design and Selection 19: 431-437, 2006.

Korotkova N, Le Trong I, Samudrala R, Korotkov K, Van Loy CP, Bui A-L, Moseley SL, Stenkamp RE. Crystal structure and mutational analysis of the DaaE adhesin of Escherichia coli . Journal of Biological Chemistry 281: 22367-22377, 2006.

Wang K, Samudrala R. Automated functional classification of experimental and predicted protein structures. BMC Bioinformatics 7: 278, 2006.

Howell DPG, Samudrala R, Smith JD. Disguising itself - insights into Plasmodium falciparum binding and immune evasion from the DBL crystal structure. Molecular and Biochemical Parasitology 148: 1-9, 2006.

Wang K, Mittler J, Samudrala R. Comment on "Evidence for positive epistasis in HIV-1". Science 312: 848b, 2006.

Chang AN, McDermott J, Guerquin M, Frazier Z, Samudrala R. Integrator: Interactive graphical search of large protein interactomes over the Web. BMC Bioinformatics 7: 146, 2006.

Ngan S-C, Inouye M, Samudrala R. A knowledge-based scoring function based on residue triplets for protein structure prediction. Protein Engineering, Design and Section 19: 187-193, 2006.

Jenwitheesuk E, Samudrala R. Heptad-repeat-2 mutations enhance the stability of the enfuvir tide-resistant HIV-1 gp41 hairpin structure. Antiviral Therapy 10: 893-900, 2005.

Cheng G, Qian B, Samudrala R, Baker D. Improvement in protein functional site prediction by distinguishing structural and functional constraints on protein family evolution using computational design. Nucleic Acids Research 33: 5861-5867, 2005.

Jenwitheesuk E, Samudrala R. Identification of potential multitarget antimalarial drugs. Journal of the American Medical Association 294: 1490-1491, 2005.

Wang W, Zheng H, Yang S, Yu H, Li J, Jiang H, Su J, Yang L, Zhang J, McDermott J, Samudrala R, Wang J, Yang H, Yu J, Kristiansen K, Wong GK, Wang J. Origin and evolution of new exons in rodents. Genome Research 15: 1258-1264, 2005.

Liu T, Jenwitheesuk E, Teller D, Samudrala R. Structural Insights into the Cellular Retinaldehyde Binding Protein (CRALBP). Proteins: Structure, Function, and Bioinformatics 61: 412-422, 2005.

McDermott J, Bumgarner RE, Samudrala R. Functional annotation from predicted protein interaction networks. Bioinformatics 21: 3217-3226, 2005.

McDermott J, Guerquin M, Frazier Z, Chang AN, Samudrala R. BIOVERSE: Enhancements to the framework for structural, functional, and contextual annotations of proteins and proteomes. Nucleic Acids Research 33: W324-W325, 2005.

Hung L-H, Ngan S-C, Liu T, Samudrala R. PROTINFO: New algorithms for enhanced protein structure prediction. Nucleic Acids Research 33: W77-W80, 2005.

BIOGRAPHICAL SKETCH

NAME Singh, Pradeep K.	POSITION TITLE Associate Professor
eRA COMMONS USER NAME singhp	

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	YEAR(s)	FIELD OF STUDY
Columbia University, New York	B.A.	1985	Biology/Biophysics
Northwestern University Medical School, Chicago	M.D.	1989	Medicine
University of Iowa College of Medicine, Iowa City	Residency	1992	Internal Medicine
University of Iowa College of Medicine, Iowa City	Fellowship	1998	Pulmonary Disease and Critical Care Medicine

A. RESEARCH AND PROFESSIONAL EXPERIENCE

Positions and Employment

2005-present	Associate Professor	University of Washington School of Medicine
2000-2005	Assistant Professor	University of Iowa College of Medicine
1996-2000	Pulmonary Fellow/Associate	University of Iowa College of Medicine,
1992-1995	Clinical Instructor	Indiana University School of Medicine
1992-1995	General Internist	Internal Medicine Associates of Bloomington, IN
1984-85	Assistant Instructor	Columbia University College of Arts and Sciences

Honors

2007	Clinical Scientist Award in Translational Research, Burroughs Wellcome Fund.
1999	Leroy Mathews Physician Scientist Award, Cystic Fibrosis Foundation
1998	Research Fellowship, Parker B Francis Foundation.
1997-98	Clinical Teacher of the Year Nominee, University of Iowa College of Medicine.
1993-94	Medical Student Teaching Award, Runner Up, Indiana University School Med.
1983-85	Deans List, Columbia University

B. PUBLICATIONS (in chronological order)

1. **Singh PK,** Tack BF, McCray PB, Welsh MJ: Synergistic and Additive Killing by Antimicrobial Factors Found in Human Airway Surface Liquid. Am. J. Physiol., 279(5):L799-L805, 2000.
2. **Singh PK,** Schaefer AL, Parsek MR, Moninger TO, Welsh MJ, Greenberg EP: Quorum-Sensing Signals Indicate that Cystic Fibrosis Lungs are Infected with Bacterial Biofilms. Nature, 407(6805):762-764, 2000.
3. Travis SM, **Singh PK,** Welsh MJ; Antimicrobial Peptides and Proteins in the Innate Defense of the Airway Surface. Curr. Opin. Immunol., 13(1):89-95, 2001.
4. **Singh PK,** Parsek MR, Welsh MJ, Greenberg EP: Lactoferrin, An Antimicrobial Factor of Human Airways, Prevents Biofilm Formation by *P. aeruginosa*. Pediatr. Pulmonol. Suppl., 32:282, 2001.
5. **Singh PK,** Parsek MR, Greenberg EP, Welsh MJ: A Component of Innate Immunity Prevents Bacterial Biofilm Development. Nature, 417:552-5, 2002.
6. McCaw ML, Lykken L, **Singh PK**, and Yahr, TL: ExsD is a Negative Regulator of the *Pseudomonas aeruginosa* Type III Section Regulon. Mol. Microbiol, 46:1123-1133, 2002.

7. Parsek MR, **Singh PK**: Bacterial Biofilms: An Emerging Link to Disease Pathogenesis, Annu. Rev. Microbiol., 57:677-701, 2003.
8. **Singh PK**: Iron Sequestration by Human Lactoferrin Stimulates *P. aeruginosa* Surface Motility and Blocks Biofilm Formation. BioMetals 17(3):267-70, 2004.
9. Boles BR, Thoendel M, **Singh PK**: Self-Generated Diversity Produces "Insurance Effects" in Biofilm Communities. Proc. Natl. Acad. Sci. USA, 101(47):16630-5, 2004.
10. Palmer KL, Mashburn LM, ASingh PK. Whiteley M: Cystic fibrosis sputum supports growth and cues key aspects of Pseudomonas aeruginosa physiology. J. Bacteriol., 187: 5267-5277, 2005.
11. Boles BR, Thoendel M, Singh PK. Rhamnolipids mediate detachment of *Pseudomonas aeruginosa* from biofilms. Mol Microbiol., 57: 1210-1223, 2005.
12. Landry RM, An D, Hupp JT, **Singh PK**, Parsek MR: Mucin-*Pseudomonas aeruginosa* interactions promote biofilm formation and antibiotic resistance. Mol. Microbiol., 59: 142-151, 2006.
13. Garcia-Medina R, Dunne WM, **Singh PK**, Brody SL: *Pseudomonas aeruginosa* acquires biofilm-like properties within airway epithelial cells. Infect. Immun., 73: 8298-8305, 2005.
14. Boles BR, Thoendel M, **Singh PK**: Genetic variation in biofilms and the insurance effects of diversity. Microbiology, 151(Pt 9):2816-8, 2005.
15. Nguyen D, **Singh PK**: Evolving stealth: genetic adaptation of *Pseudomonas aeruginosa* during cystic fibrosis infections. Proc Natl Acad Sci USA, 103: 8305-8306, 2006.
16. Soong G, Muir A, Gomez MI, Waks J, Reddy B, Planet P, **Singh PK,** Kaneko Y, Wolfgang MC, Hsiao YS, Tong L, Prince A: Bacterial neuraminidase facilitates mucosal infection by participating in biofilm production. J Clin Invest, 116: 2297-2305, 2006.
17. Kaneko Y, Thoendel M, Olakanmi O, Britigan BE, **Singh PK**: The transition metal gallium disrupts *Pseudomonas aeruginosa* iron metabolism and has antimicrobial and anitbiofilm activity. J Clin Invest., 17: 877-888, 2007.

BIOGRAPHICAL SKETCH

NAME Sokourenko, Evgueni V.	POSITION TITLE Associate Professor
eRA COMMONS USER NAME EVS123	

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	YEAR(s)	FIELD OF STUDY
Moscow Medicical Sechenov Acadamey, Moscow, USSR	MD	1985	Occupational & Environmental Medicine
All-Union Institute of Genetics, Moscow, USSE	PhD	1989	Microbiology

A. POSITIONS AND HONORS

Professional Employment:

1989- 1990 Research Investigator, Laboratory of Immunoecology and Medical Biotechnology, Moscow Medical Academy, Moscow, USSR
1990-1994 Postdoctoral Research Associate, Department of Anatomy and Neurobiology, University of Tennessee, Memphis.
1994-1998 Research Instructor, Department of Anatomy and Neurobiology, University of Tennessee, Memphis
jan 1999 - jun 2002 Research Assistant Professor, Department of Microbiology, University of Washington, Seattle
jul 2002 – jun 2004 Assistant Professor, Department of Microbiology, University of Washington, Seattle
jul 2004 - present Associate Professor, Department of Microbiology, University of Washington, Seattle

Invited Presentations:

1994 Department of Biological Sciences, University of Pittsburgh, Pittsburgh, PA
1995 Department of Microbiology, University of Rhode Island, Kingston, RI
1997 Department of Molecular Microbiology, Washington University, St. Loius, MO
1997 Department of Urology, New York University, New York, NY
1997 Gordon Conference on "Molecular Mechanisms of Bacterial Adhesion and Signaling", Newport, RI
1998 ASM Meeting, Atlanta, GA, Session on "Evolution of Bacterial Virulence"
1998 Department of Medicine, University of Minnesota, Minneapolis, MN
1998 Department of Microbiology, University of Washington, Seattle, WA
1999 Department of Molecular Pharmacology, Albert Einstein College of Medicine, Bronx, NY
1999 Institute for Cancer Research, Fox Chase Cancer Center, Philadelphia, PA
2001 ASM/TIGR conference on 'Microbial Genomics', Monterey, CA
2001 Abbott Laboratories, Inc., Abbott Park, IL.
2003 Dept. of Pathobiology, Univ. of Washington, Seattle, WA
2003 Seattle Biomedical Research Institute, Seattle, WA
2003 Dept. of Biological Sciences, Auburn University, Auburn, AL

2004 ASM General Meeting, New Orleans, LA, Colloquim on “New Concepts in the Adherence of Bacterial Pathogens” (convener)
2004 Dept. of Microbiology, University of Rhode Island, Kingston, RI
2004 BioCentrum, Danish Technical University, Copenhagen, Denmark
2004 Dept. of Enteric Pathogens, Serum Institute, Copenhagen, Denmark
2005 Basic Research Division, VA Medical Hospital, Minneapolis, MN
2005 Dept. of Microbiology, OHSU, Portland, OR
2005 Glycobiology Society, Johns Hopkins University Medical School
2005 Dept. of Biology, Johns Hopkins University
2005 ASM General Meeting, Atlanta, GA, Session on ‘Evolution of Bacterial Virulence’
2006 Swiss Federal Institute of Technology, ETH, Zurich, Switzerland
2006 ASM Northwest branch, Session on Evolution of Virulence.
2006 Dept. of Microbiology and Immunology, University of Iowa, Iowa city, IA
2006 ASM General Meeting, Orlando, FA, Session on ‘Pathoadaptive mutations: Gene Loss and Mutation in Bacterial Pathogens’ (convener)
2006 Max Planck Institute for Infection Biology, Berlin, Germany
2007 Center for Genome Research and Biocomputing, Oregon State University, Corvallis, OR.
2007 Infectious Diseases Directorate, Naval Medical Research Center, Silver Spring, MD
2008 Dept. of Immunology, Mount Sinai School of Medicine, New York, NY
2008 23rd Annual Symposium of the US International Association for Ecology, Madison, WI
2008 Dept. of Medical Microbiology, U. of Wisconsin, Madison, WI
2008 Dept. of Urology, Northwestern University School of Medicine, Chicago, IL
2008 Dept. of Veterinary Molecular Biology, Montana State University, Bozeman

B. SELECTED PEER-REVIEWED PUBLICATIONS

- Schembri, M.A., E.V. Sokurenko, T. Knudsen, and P. Klemm. 2000. Functional Flexibility of the FimH Adhesin: Insights From a Random Mutant Library. Infection & Immunity. 68(5):2638-2646.
- Schembri, M.A., Kjaergaard, K., Sokurenko, E.V., and P. Klemm. 2001 Molecular characterization of the *Escherichia coli* FimH adhesin. J. Infect. Dis. 183:S28-31.
- 20. Sokurenko E.V., M. Schembri, E. Trintchina, K. Kjaergaard, D. Hasty and P. Klemm. Valency Conversion in the Type 1 Fimbrial Adhesin of Escherichia coli. Molecular Microbiology (From the Cover), 41(3), pp. 675-686. (2001)
- Sokurenko E.V., V. Tchesnokova, A. Yeung, C. Oleykowski, E. Trintchina, K. Hughes, R. Rashid, M. Brint, S. Moseley, and S. Lory. Detection of Simple Mutations and Polymorphisms in Large Genomic Regions. Nucleic Acids Research, Vol 29, No. 22, p. e111-115 (2001)
- Johnson, J.R., S.J. Weissman, AL. Stell, E. Trintchina, D.E. Dykhuizen and E. Sokurenko.
- Clono-Pathotypic Analysis of Archetypal Escherichia coli Cystitis Isolate NU14. Journal of Infectious Diseases Dec 15;184(12):1556-65 (2001)
- Sokurenko E.V. Discovering the sweeping power of point mutations by using GIRAFF. Trends in Microbiology, Vol. 9, pp. 522-525, (2001)
- Thomas W.E., E. Trintchina, M. Forero, V. Vogel, and E. V. Sokurenko. Bacterial adhesion to target cells enhanced by shear force. Cell, June 28, 109(7):913-923 (2002)
- Weissman S. J., S. L. Moseley, D. E. Dykhuizen and E. V. Sokurenko. Enterobacterial adhesins and the case for studying SNPs in bacteria, Trends in Microbiology Vol 11, 3, p. 115-117 (2003)
- Y.V. Pereverzev, O.V. Prezhdo, W.E. Thomas and E.V. Sokurenko. Distinctive features of the biological catch-bond in the jump-ramp force regime predicted by the two-pathway model. Physical Reviews E. 2005 Jul;72(1 Pt 1):010903
- Weissman S.J., S. Chattopadhyay, P. Aprikian, M. Obata-Yasuoka, Y. Yarova-Yarovaya, A. Stapleton, W. Ba-Thein, D. Dykhuizen, J.R. Johnson and E.V. Sokurenko. Clonal analysis reveals high rate of structural mutations in fimbrial adhesins of extraintestinal pathogenic Escherichia coli. Molecular Microbiology (2006) 59 (3), 975–988.

- Sokurenko E.V., R. Gomulkiewicz and D.E. Dykhuizen. Source-sink dynamics of virulence evolution. Nature Reviews Microbiology, 2006 Jul;4(7):548-5
- Chattopadhyay S, Feldgarden M, Weissman SJ, Dykhuizen DE, van Belle G, Sokurenko EV. Haplotype diversity in "source-sink" dynamics of Escherichia coli urovirulence. J. Molecular Evolution. 2007 Feb;64(2):204-14.
- Korotkova N, Chattopadhyay S, Tabata TA, Beskhlebnaya V, Vigdorovich V, Kaiser BK, Strong RK, Dykhuizen DE, Sokurenko EV, Moseley SL. Selection for functional diversity drives accumulation of point mutations in Dr adhesins of Escherichia coli. Molecular Microbiology. 2007 Apr;64(1):180-94.
- Weissman SJ, Beskhlebnaya V, Chesnokova V, Chattopadhyay S, Stamm WE, Hooton TM, Sokurenko EV. Differential stability and trade-off effects of pathoadaptive mutations in the E. coli FimH adhesin. Infect Immun. 2007 May 14
- Chattopadhyay, S, DE. Dykhuizen and EV. Sokurenko. ZPS: Visualization of Recent Adaptive Evolution of Proteins. BMC Bioinformatics. 2007 Jun 7;8:187
- Gomez-Duarte OG, Chattopadhyay S, Weissman SJ, Giron JA, Kaper JB, Sokurenko EV. Genetic diversity of the gene cluster encoding longus, a type IV pilus of enterotoxigenic Escherichia coli. J Bacteriol. 2007 Dec;189(24):9145-9.
- Ronald, L, Yakovenko, O, Yazvenko, N, Chattopadhyay, S, Aprikian, P., Thomas, W., Sokurenko, E., Adaptive mutations in the signal peptide of the type 1 fimbrial adhesin of uropathogenic Escherichia coli. PNAS 2008 Aug 5;105(31):10937-42
- Pereversev, Yu, Prezhdo, O, Sokurenko, E. Anomalously increased lifetimes of biological complexes at zero-force are due to the protein-water interface. Anomalously Increased Lifetimes of Biological Complexes at Zero Force Due to the Protein-Water Interface. Journal of Physical Chemistry B. 2008 Aug 19.
- Sokurenko, E, Vogel, V, and Thomas, WE. Catch-bond mechanism of force-enhanced adhesion: counterintuitive, elusive, but ... widespread? Cell Host and Microbe, 2008 Oct 16;4(4):314-23.
- Stahlhut, S, Struve, SJ. Weissman, S Chattopadhyay, SJ. Libby, F. Fang, KA Krogfelt, EV. Sokurenko. Clonal population analysis of Klebsiella pneumoniae. Journal of Bacteriology (In Press)

BIOGRAPHICAL SKETCH

NAME	POSITION TITLE
Traxler, Beth A.	Associate Professor of Microbiology
eRA COMMONS USER NAME btraxler	

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	YEAR(s)	FIELD OF STUDY
Manchester College (N. Manchester, IN)	B.A.	1982	Biology/French
Carnegie Mellon University (Pittsburgh, PA)	Ph.D.	1987	Biology
Harvard Medical School (Boston, MA)	Postdoc	1988-92	Microbiology/Molecular Genetics

POSITIONS AND HONORS

RESEARCH and PROFESSIONAL POSITIONS:

1982-87 Ph.D thesis research, Carnegie Mellon University; Thesis advisor, E.G. Minkley, Jr.; topic: Conjugal DNA metabolism during F plasmid-mediated conjugation.

1988-92 Postdoctoral Fellow, Harvard Medical School. Mentor: Jon Beckwith; topic: Assembly of cytoplasmic membrane proteins in *E. coli.*

1992-1999 Assistant Professor of Microbiology, University of Washington.

1999-present Associate Professor of Microbiology, University of Washington. Research interest: Assembly of integral membrane proteins; molecular mechanism of bacterial conjugation; nanotechnology and manipulation of protein surfaces for interaction with inorganic materials.

HONORS, RESEARCH AWARDS, and PROFESSIONAL SERVICE:

1978-82 National Merit Scholar, Manchester College

1981 NSF Undergraduate Research Participation Program, Illinois State University

1982 Graduation with Distinction, Manchester College

1982-83 Richard Mellon King Fellowship, Carnegie Mellon University

1988-91 NIH National Research Service Award, Harvard Medical School

1999-2001 American Society for Microbiology, Chair/Chair-elect, Division H (Molecular Biology & Genetics)

1999-present American Society for Microbiology, editorial board, Microbiology and Molecular Biology Reviews

2004-2005 NSF Prokaryotic Cellular & Molecular Biology Grant Review Panel

2005-2008 NSF Microbiology Panel, Graduate Research Fellowship Program

C. SELECTED PEER-REVIEWED PUBLICATIONS (of 30 total, in chronological order)

Original research publications

Schröder, G., S. Krause, E.L.Zechner, B. Traxler, H.-J. Yeo, R. Lurz, G. Waksman, and E. Lanka. 2002. TraG-like proteins of DNA transfer systerms and of the H. pylori Type IV secretion system: inner membrane gate for exported substrates? J. Bacteriology **184**:2767-2779.

Kennedy, K.A., E. Gachelet, and B. Traxler. 2004 Evidence for multiple pathways in the assembly of the *E. coli* maltose transport complex. J. Biological Chemistry **279**: 33290-33297.

Sharma, S., J.A. Davis, T. Ayvaz, B. Traxler and A.L. Davidson. 2005. Functional reassembly of the *E. coli* maltose transporter following purification of a MalF-MalG subassembly. J. Bacteriology, **187**: 2908-2911.

Dai, H., W.S. Choe, C.K. Thai, M. Sarikaya, B.A. Traxler, F. Baneyx, and D.T. Schwartz. 2005. Nonequilibrium synthesis and assembly of hybrid inorganic-protein nanostructures using an engineered DNA binding protein. J. Amer. Chem. Soc., **127**:15637-15643.

Haft, R.J.F., G. Palacios, T. Nguyen, M. Mally, E.G. Gachelet, E.L. Zechner, and B. Traxler. 2006. General mutagenesis of F plasmid TraI reveals its role in conjugative regulation. J. Bacteriology **188**: 6346-6353.

Haft, R.J.F., E.G. Gachelet, T. Nguyen, L. Toussaint, D.C. Chivian, and B. Traxler. 2007. In vivo oligomerization of the F conjugative coupling protein TraD. J. Bacteriology **189**: 6626-6634.

Larkin, C., R.J.F. Haft, M.J. Harley, B. Traxler, and J.F. Schildbach. 2007. Roles of active site residues and the HUH motif of F plasmid TraI relaxase. J. Biol. Chem. **282**: 33707-33713.

Reviews

Traxler, B., D. Boyd, and J. Beckwith. 1993. The topological analysis of integral cytoplasmic membrane proteins. J. Membrane Biology **132**: 1-11.

Manoil, C., and Traxler B. 1995. The genetic analysis of integral membrane protein assembly. Annual Review of Genetics **27**:131-150.

Manoil, C. and B. Traxler. 2000. Use of in-frame insertion mutations for the analysis of protein structure and function. Methods **20**: 55-61.

Traxler, B. and E. Gachelet. 2007. Sets of transposon generated sequence-tagged mutants for structure-function analysis and engineering. Methods in Enzymology, **421**: 83-90.

Appendix F: Strategic Planning

The Departmental of Microbiology strategic plan encompasses the following goals:

- The hiring of two assistant professors to fill vacancies from retirements.
- A faculty hire at the associate or full professor level to fill the vacancy created by the passing of Dr. Carleen Collins.
- The renovation of the first two floors of the J-wing for 11 current faculty members plus future faculty hires.
- Leadership and faculty support for the creation of an institute at South Lake Union that focuses on systems biology and infectious diseases.
- Continued efforts to recruit URM's into the graduate program and the faculty.
- A streamlined support staff (administrative and fiscal) to improve services and maximize efficiency.
- Implementation of new mentoring policy for junior faculty.
- Continued attention to both curriculum requirements and course material to better serve both undergraduate and graduate students.
- Improved response to feedback from undergraduate exit surveys.
- Identify a more stable funding base to support first year graduate students during their rotations.
- Improve communications within the Department and between the campus and off-campus units.

Appendix G
HEC Board Summary

Department of Microbiology
School of Medicine
Degrees: B.S., M.S. Ph.D.
Last reviewed 2000
Current date: April 27, 2009

A. Documentation of continuing need, including reference to the statewide and regional needs assessment

The importance of well-trained individuals in the field of microbiology to the State and the nation cannot be overstated and the UW Microbiology Department is paramount in preparing the next generation of scientists to fulfill the region's needs in this regard. Infectious diseases will continue to present major health challenges into the foreseeable future and the emergence of drug resistance and new types of chronic infections only exacerbate the problems. The work of microbiologists is central to the understanding, diagnosis, and treatment of bacterial and viral diseases. Microbiologists play a key role in identifying, developing, and testing new antimicrobial drugs. Through genetic engineering and a basic understanding of bacteria, microbiologists will contribute new solutions to old problems such water pollution, and develop new technologies for the generation of alternate materials and energy sources for the future. Microbiologists will continue to be at the forefront in the use of bacteria and viruses to develop new genetic tools for the study and treatment of disease. Microbiologists will play a key role in the future development of nanoscale machines that will have many industrial and medical applications.

In addition, the Ph.D. program in Microbiology trains individuals to be the intellectual leaders of the future in academia, research, medicine, business, ecology, and technology. These individuals are indispensable members of the scientific community who carry on the legacy of discovery and innovation.

B. Assessment information related to expected student learning outcomes and the achievement of the program's objectives

The learning goals of the B.S. program are to teach (i) critical thinking, (ii) problem solving, (iii) quantitative reasoning, (iv) a fundamental knowledge of microbiology, (v) an understanding of key concepts, (vi) an appreciation for scientific methodology including the scientific method, and (vii) the ability to engage in scientific discourse, both written and oral. At the time of graduation, majors are asked to fill out a questionnaire that asks about their satisfaction with their training and their future plans. The data derived from the survey is useful in evaluating outcomes in relation to some of the goals stated above. Classroom performance and feedback regarding the independent study courses (library research and undergraduate research) provide

additional metrics for evaluating our performance as instructors. Additional insights about our overall performance can be gleaned from surveys of graduates taken one year after graduation by the Office of Educational Assessment. The following results were taken from the "Graduate Survey Results 2005" (the most recent survey available) where the response rate was only 24% (11 out of 46 graduates). Ten out of 11 respondents said if they had to do it over again, they would choose to go the UW. When asked about their satisfaction with the UW's contribution to their development in "understanding and applying scientific principles and methods" the mean score was 4.8 (out of 5). Similarly high rankings were given to questions regarding the UW's contribution to "working and/or learning independently" (4.4) and "using knowledge, ideas, or perspectives gained from major field" (4.3). Finally, they ranked the "quality of instruction in your major field" as a 4.3. For all of these metrics, the rankings for microbiology majors was significantly above the mean rankings for all of the students in the College of Arts and Sciences.

C. Plans to improve the quality and productivity of the program

The results of a recent review of the undergraduate program carried out by the Undergraduate Curriculum and Advising Committee can be summarized as follows: The quality of the students in the program remains overall very high and there has been little or no grade inflation over the past 10 years. It was decided to require a minimum grade of 2.0 in Biol 200 (Introductory Biology) for entry into the major and for taking 400 level microbiology classes. These changes are designed to reduce the number of students who are poorly prepared for success in our courses. Name changes were suggested for Microm 443 (from Medical Microbiology Lab to Medical Bacteriology Lab) and Microm 412 (from Fundamental of General III to Prokaryotic Diversity) which will be implemented in the near future. It was suggested that Microm 435 (Microbial Ecology) be revised and updated, and this change will be implemented next year with Pete Greenberg and John Mittler as the instructors.

The Graduate Policy and Advising Committee reviews and updates the Graduate Program Guidelines on a regular basis in response to changing policies approved by the faculty. The last major update was in November 2008 when the requirement for biomedical ethics training was added and a detailed description of the thesis format was included. Tables showing the mentoring schedule along with the deadlines for the various stages of the degree were also added at that time.

Bachelor of Science Degrees:
Autumn-Summer 2004-2008: Majors can enter the program any quarter.

	2004-2005	2005-2006	2006-2007	2007-2008
Enrolled Majors	Autumn '04 120 Winter '05 129 Spring '05 132 Summer '05 52	Autumn '05 126 Winter '06 135 Spring '06 134 Summer '06 53	Autumn '06 135 Winter '07 144 Spring '07 140 Summer '07 65	Autumn '07 145 Winter '08 160 Spring '08 161 Summer '08 63
Degrees Granted	Autumn '04 6 Winter '05 8 Spring '05 34 Summer '05 2 **Total 50** Win'05 estimate	Autumn '05 1 Winter '06 7 Spring '06 32 Summer '06 6 **Total 46**	Autumn '06 2 Winter '07 9 Spring '07 30 Summer '07 5 **Total 44** Aut'06 estimate	Autumn '07 1 Winter '08 7 Spring '08 37 Summer '08 4 **Total 49**

Ph.D. degrees:
Autumn – Summer 2004-2008
Ph.D. Student Enrollment. Offered admission in Autumn once a year.

	Autumn 2004	Autumn 2005	Autumn 2006	Autumn 2007
Enrolled students in Ph.D. Program	31	40	46	43

Ph.D. and Master's degrees awarded
Autumn – Summer 2004-2008

	2004-2005	2005-2006	2006-2007	2007-2008
Ph.D. Degrees awarded	Autumn '04 0 Winter '05 0 Spring '05 0 Summer '05 1 **Total 1**	Autumn '05 1 Winter '06 1 Spring '06 1 Summer '06 0 **Total 3**	Autumn '06 1 Winter '07 0 Spring '07 3 Summer '07 1 **Total 5**	Autumn '07 1 Winter '08 0 Spring '08 3 Summer '08 2 **Total 6**
M.S. Degrees				Autumn'06 1 Autumn '07 1 Spring'08

Appendix H
Microbiology Student Awards

Undergraduate Awards

Bassett Award

The Don Bassett Memorial Fund was established in 1965 by the contributions of students, faculty members, administrative and technical staff of Health Science departments, and friends and members of the Bassett family. The fund was established as a memorial to Don Bassett, an undergraduate Microbiology major, who died while in his third year at the University of Washington. The fund provides a grant to a worthy undergraduate microbiology student whose studies would be helped by the award.

Chiller Award

The Jacques M. Chiller award was established in 1999 on behalf of the family of Dr. Jacques M. Chiller. The Chiller award is to be granted at the end of the junior year to a student majoring in Microbiology, and is intended to help defray the student's education expenses for their final year. Students in their first year as a Microbiology major are invited to apply. An important criterion for selection is academic merit.

Evans Award

Dr. Evans was appointed as the first chairman of the Microbiology Department in 1946, and served in that position for 24 years. The Charles Evans Award Fund was established when Dr. Evans retired, in June of 1982. Contributions to this fund were made by friends, colleagues, former students, and members of his family. The fund provides an annual award for the graduating microbiology major with the highest cumulative grade point average.

Ordal Award

The Erling J. Ordal Award Fund was established in 1988 as a memorial to Professor Ordal through contributions made by friends, former students, colleagues, and members of the family. Dr. Ordal was a professor in the Department from 1937 until his retirement in 1977. The fund provides an annual award for the best undergraduate research thesis.

Graduate Student Awards

Helen Riaboff Whiteley Endowed Fellowship

The Helen Riaboff Whiteley Fellowship was established in 1991 by her husband, UW Professor Emeritus Arthur Whiteley, and her friends to honor her academic and research achievements. Dr. Helen R. Whiteley was a distinguished member of the

faculty of the Department of Microbiology in the School of Medicine for close to 40 years. The purpose of the Fellowship Fund is to provide financial support to a deserving graduate student in his/her last year of Ph.D. research in the Department of Microbiology. The primary selection criterion for this award is the nominee's research accomplishments. Other factors include participation in and contributions to the Department's various activities.

Stanley Falkow Graduate Student Award

The Stanley Falkow Graduate Student Award was started in 2005 as an endowment by Pete Greenberg and has grown in value since due to the generosity of Stanley Falkow's many friends and colleagues. The award is intended for a graduate student interested in traveling to a course or a laboratory at another institution to enhance or broaden their research capabilities or thesis research. Applications are also consider for attendance at a special conference or meeting.

Neal Groman Graduate Student Award

The Neal Groman Fund was established in 2001 by the contributions of fellow faculty members, former students, administrative and technical staff of many Health Sciences department and friends and members of the Groman family. The purpose of the fund is to recognize an outstanding microbiology graduate student who demonstrates excellence in teaching and mentoring of undergraduate students.

Appendix I

JUNIOR FACULTY MENTORING
DEPARTMENT OF MICROBIOLOGY

Purpose

The Department of Microbiology encourages all of its faculty to develop their full potential, and be successful contributors to the missions of the Department, the School, and the University. It is the responsibility of each faculty member to be familiar with the Department of Microbiology Promotions Criteria, and University of Washington processes and requirements for promotion. With those requirements and processes in mind, each faculty member is expected to take steps to meet goals for promotion.

The main purpose of the mentoring program is to help faculty evaluate how to meet these goals, and to help them develop throughout their careers. Assistant Professors, in particular, are encouraged to take advantage of meetings with mentor(s) and the department Mentoring Committee to help them assess their progress towards meeting the criteria for promotion. These meetings can also be a supplemental source of information to the Chair and the faculty member as part of the regular periodic reviews of faculty academic progress.

Procedure

1. By mutual agreement between the Department Chair and the junior faculty member, assistant professors are assigned primary faculty mentor(s) (associate or full professors). In general, mentor and mentee should meet on a regular basis at least twice per year, at which times the mentee can discuss and assess progress in areas including but not limited to, research, collaboration(s), funding strategies and opportunities, publication(s), laboratory management, time management, networking, teaching strategies and evaluations, student mentoring and recruiting, service to the department, etc. The mentee should initiate these regular meetings and is encouraged to discuss these topics with the mentor on an informal basis as well. As grant funded research and publications are important areas of development for junior faculty, primary mentor(s) may provide, or arrange for, peer feedback on grants and manuscripts prior to their submission.

2. Prior to meeting with the department Mentoring Committee, which will be composed of no more than 5 members, the faculty member will prepare documentation (see below) for the preceding academic year(s). Typically, assistant professors will meet with the committee once a year. Meeting with the committee can be self-initiated, or initiated at the request of the committee.

3. Faculty member meets with the department's Mentoring Committee, which reviews progress towards meeting promotion criteria in the areas of research, teaching and

service, per the Department of Microbiology A&P Guidelines. The committee may make suggestions regarding how the faculty member can further progress towards meeting the criteria and prepares a brief memorandum summarizing the outcome of the conference.

4. Subsequent to meeting with the Mentoring Committee, the faculty member may also schedule an optional follow-up meeting to review progress with the department chair. The Mentoring Committee may also recommend such a meeting in circumstances where the faculty member's progress may be improved by alterations in duties, provision of departmental resources and/or reassignment of primary faculty mentor(s).

The mentoring process is intended to support the faculty member in his or her professional progress. The faculty member is ultimately responsible for such progress, and for meeting promotion criteria. The promotion process includes review at the Department, School, and Provost level.

Documentation to prepare in advance of meeting with the Mentoring Committee

1. Full curriculum vitae in approved School of Medicine format (see below).

2. Annual Activity Report highlighting work done in the last year and describing work that is not described on the regular CV.

3. Prioritized List of Goals, both short term (6 months – 1 year) and long term (3 to 5 years) in three areas of evaluation: research, teaching, and service.

4. In some circumstances, faculty nearing review for mandatory promotion may want to prepare for the committee's review, a draft self-assessment (1-2 pages). This is a required document included in the promotion package and summarizes a faculty member's overall accomplishments since initial appointment. Specific content will vary according to each faculty member's duties, but should cover the basic areas of research, teaching, and service outlined in the Department Appointment and Promotion Guidelines.

UNIVERSITY OF WASHINGTON **DATE OF CV**
SCHOOL OF MEDICINE

CURRICULUM VITAE FORMAT FOR ALL FACULTY

Your curriculum vitae should contain the following information:

Personal Data: Place of birth; citizenship, if applicable; date of birth optional.

Education: University of undergraduate and graduate degrees (indicate dates).

Postgraduate Training: Internship, residencies, fellowships (places and dates).

Faculty Positions Held: (places and dates).

Hospital Positions Held (if applicable): (places and dates).

Honors: Phi Beta Kappa, Sigma Xi, AOA, Prizes, RCDA's, Young Investigator Awards, Teaching Awards, etc.

Board Certification (if applicable): General Medical and Specialty Boards (indicate date received).

Current License(s) to Practice (if applicable): States and dates.

Professional Organizations: Include offices held and election to prestigious societies such as the American Society for Clinical Investigation, American Association of Physicians and others.

Teaching Responsibilities: List specific courses, specific responsibility and percentage of responsibility if shared course. Indicate role in teaching committees. List trainees during last 5 years, if primary mentor.

Editorial Responsibilities: Mention only Editorial Boards. Do not mention occasional reviewing duties.

Special National Responsibilities: Study sections, training grant committees, and other similar responsibilities.

Special Local Responsibilities: University and hospital committees.

Research Funding (current and pending): Sources, dates, dollars and PI. Include Training Grants. (If none, still include the heading and state “none.”)

Bibliography [use the format in (a) for (b) through (f)]: (please asterisk (*) the five most significant publications)

a) The first section should be manuscripts in Refereed Journals with authors listed in the order they appear in the original publication. Include manuscripts in press (i.e., accepted for publication). Number these articles consecutively and include the first and last page numbers of each article.
b) The second section: Book chapters.
c) The third section: Published books, videos, software, etc.
d) The fourth section: Other publications (e.g., in non-refereed journals and letters to the editor).
e) The fifth section: Manuscripts submitted, listed separately with date of submission. Do not list manuscripts in preparation or work in progress.
f) List Abstracts in the final section.

(Optional) Other: National invitational lectures, etc.

Other Resources:

1. Haynes L, Adams SL, Boss JM. Mentoring and networking: how to make it work. Nat Immunol. 2008 Jan;9(1):3-5. PMID: 18087246

2. Lee A, Dennis C, Campbell P. Nature's guide for mentors. Nature. 2007 Jun 14;447(7146):791-7. PMID: 17568738

3. Kahn CR. Picking a research problem. The critical decision.
N Engl J Med. 1994 May 26;330(21):1530-3. PMID: 8164709

4. Roth, JR. An Essay on Public Speaking for Graduate Students (but applicable to any speaker). 1996.

5. Stephanie Barnard. Writing, Speaking, & Communication Skills for Health Professionals. Yale University Press. 2001.

Appendix J

DEPARTMENT OF MICROBIOLOGY

Graduate Curriculum Requirements for the Ph.D. Degree

The requirements listed below are the minimum requirements to be met by all students in the Ph.D. program. The student's supervisory committee may require or recommend additional courses as deemed appropriate, based on the student's background and research plans.

Required background courses (generally satisfied prior to entry into the graduate program):

A one year course in biochemistry (equiv. to UW Bioc. 440, 441, and 442)
A course in classical and molecular genetics (equiv. to UW Genome 371 and /or 372)
A course in general microbiology (equiv. to UW Micro. 410)
A course in medical microbiology and basic immunology is recommended for those considering research in the area of medical microbiology or virology

Course requirements after entry into program (The Graduate School requires a minimum of 18 graded credits, most of which will be fulfilled by the courses listed below):

Conjoint courses totaling 6 credits**:**
6 credits of the following Conjoint courses. Conj. 524, 531, 532, 533, 534, 535, 536, 537, 538, 539, 541, 542, 544, 545, 546, 547, 548, 549, 551, 552. Each conjoint course or module is equivalent to 1.5 credits (5-6 weeks) and normally students register for 2 modules per quarter although other configurations are possible. *(Students planning to apply to the Cell and Molecular Biology Training Grant are required to complete 6 credits of conjoint courses from the selection listed above).*

It is recommended that students take additional conjoint courses or choose one or more of the Genome Sciences modules, Genome 540, 551, 552, 553, 554, 555, 576, 559, 1.5 credits each. *(Genome Science courses can not be used toward the CMB Training Grant 6 credit requirement).*

Of the following list three courses must be chosen, one virology and one bacteriology course must be among those selected. Fred Hutchinson Cancer Research Center courses (Course prefix: MCB or FHCRC) listed below may also be taken to satisfy this requirement.

Microbiology Courses:

Course		Credits	
MICROM	450	(3)	Molecular Biology of Viruses (Offered every Win.)
MICROM	510	(3)	Physiology of Bacteria (Offered alt. years, Win. 2009)
MICROM	530	(3)	Evolution of Prokaryotic Diversity (Offered alt. years, Win. 2008). Optional lab MICROM 531 (2 credits) (Offered alt. years, Win. 2008)
MICROM	553	(3)	Molecular Mechanisms of Bacterial Pathogenesis (Offered alt. years, Aut. 2007)
MICROM	441	(4)	Introduction to Immunulogy (Offered jointly with the Department of Immunology)
MCB/FHCRC	532	(3)	Human Pathogenic Viruses (Offered even years, Aut. '08)
MCB/FHCRC	542	(3)	Nucleic Acids and Enzymes (Offered alt. years, Spr. 2008)

Ethics 101 (6-7 classes Winter Quarter), jointly taught by Biochemistry and Microbiology

Faculty Research Presentations for 1st year students: MICROM 599 (2), (Offered every Aut.)

Lab Rotation: Micro. 500, minimum of 3 quarters

Journal Club: Micro. 522, Continuous enrollment

Seminar: Microbiology 520 seminar series or attendance at Fred Hutchinson seminars. Students at the Hutch are also encouraged to attend the Micro seminars. To be taken every quarter unless a conflict with teaching exists.

Research Discussion Groups: To be taken every quarter. Students should register for the appropriate course number for credit.

Additional requirements:

T. A. in at least two lab courses for undergraduates (usually satisfied in the first and/or second year).

Give at least two formal lectures in an undergraduate course (third or fourth year).

Be first author on multiple papers related to thesis research which are published or accepted for publication in refereed journals. Under some circumstances, one first-author publication would satisfy this requirement.

Appendix K

Department of Microbiology
Graduate Program Guidelines

Responsibilities of Graduate Policy and Advising Committee

The Graduate Policy and Advising Committee is chaired by the Departmental Graduate Program Coordinator and includes one or two additional faculty members. The Committee is responsible for reviewing and updating the graduate curriculum and these guidelines. During the course of a graduate student's career, the Committee provides advice and mentoring concerning prerequisites and coursework, lab rotations, exams, NSF fellowships and NIH training grants, low scholarship issues, and any areas of concern that might arise. The Chair of the Committee will preside over the rotation talks given by the first year students and oversee the annual graduate student review by the training faculty held in June of each year. See table below for summary of advising schedule for each year of graduate school. Additional resources for graduate students can be found at the Graduate School website (http://www.grad.washington.edu/)

Summary of Graduate Student Advising Schedule			
First year students	**Second year students**	**Third year students**	**Fourth year +**
Before beginning of Autumn Quarter, course advising workshop for group. Individual course advising as needed.	Beginning of Autumn Quarter, meet as a group with Policy and Advising Committee to discuss procedures for choosing a committee and selecting a topic for the Topic Qualifying Exam in the Spring	Beginning of Autumn, Quarter, meet as a group with Policy and Advising Committee to discuss the format and procedures for the written proposal and oral exam components of the general exam	Spring or Summer Quarter, meet with Ph.D. thesis committee to review progress.
In the middle of Autumn Quarter, attend faculty-led workshop to discuss how to prepare an NSF fellowship or NIH training grant application.	During Summer Quarter, recommendation is to meet with Ph.D. thesis committee to review research progress and receive feedback on Specific Aims (not an exam).	Spring or Summer Quarter, meet with Ph.D. thesis committee to review progress.	
Near end of Autumn Quarter, meet individually with Policy and Advising Committee to review course planning and rotations.			
Beginning of Spring Quarter meet individually with Committee to review academic progress and rotations.			

Initial Advising and Workshops

In the two weeks before classes start, first year students attend a series of required workshops (Microbiology orientation, RA workshop, TA orientations, safety seminar, etc.). The group of incoming students will meet as a group with a faculty/student advising committee to discuss their course options for the upcoming year. See Graduate Curriculum for the list of requirements for the Ph.D. degree. Prior to this meeting, the students should review the course requirements and prepare a tentative plan. Registration for classes should be completed prior to the first day of classes. Courses may be added or dropped within the first week of the quarter without a financial penalty.

Laboratory Rotations

Graduate students rotate through three laboratories during their first year (four if they do an early rotation in the summer prior to the first year)**. Each rotation lasts one quarter (Microm 500). The primary purpose of the rotations is to acquaint the students with faculty members and their labs in order to provide a basis for choosing an advisor for their Ph.D. thesis research. At the end of each rotation, the students will give a 15 minute rotation report to the Department at a forum to be scheduled during finals week. The faculty supervisor will write a brief evaluation of the student's performance during his/her rotation to be placed in the student's file. Near the end of the Autumn Quarter and again at the beginning of Spring quarter , the first year students meet individually with the Graduate Policy and Advising Committee to discuss their academic progress and rotations and their future plans.

**It is important to note that participation in a rotation does not guarantee that there will be funding or space within the lab for thesis research.

Choosing Laboratory Rotations

Prior to the beginning of Autumn quarter, the Department holds a two day research retreat at an off-campus site. Besides providing a forum for the faculty and members of their groups to discuss recent research developments, the retreat provides an opportunity for first year students to learn about faculty interests before deciding on their rotations for Autumn quarter. During Autumn quarter, a series of bi-weekly meetings (Microm 599) will be set up at which the first year students will hear research presentations by faculty members (two per meeting) These meetings are designed to provide an overview of the research projects in each lab and will provide a basis for making rotation decisions for the Winter and Spring Quarters.

Choosing an Advisor

The choice of a thesis advisor is obviously an important one and is worthy of considerable care and thought both during and after the rotations. A guide to obtaining

good mentoring as a graduate student is available online from the Graduate School (http://www.grad.washington.edu/mentoring/GradStudentMentor.pdf). It should be emphasized that the selection of an advisor depends on numerous factors and is not a unilateral decision on either the student's or faculty member's part. The first year students should plan to discuss thesis research opportunities and available funding with those faculty members with whom they rotate and who are doing work in their areas of interest. Students should meet with potential faculty thesis advisors on several occasions to explore the kind of research projects available and to get a sense for the way the faculty member approaches research problems and mentoring. First year students should plan to choose their thesis advisor in the last two weeks of Spring quarter. No commitments are to be made by either the students or the faculty before this time. In exceptional circumstances, a student might choose to rotate a fourth time in the summer following the first year.

Support

Most graduate students are supported from Departmental funds as Research Assistants (RAs) in their first year. In the Autumn quarter of the first year, all eligible students should apply for an NSF fellowship. In the Spring of the second year, eligible students are strongly encouraged to apply for a position on the Cell and Molecular Biology (CMB) training grant (or any other applicable training grant). After the first year, all students are supported either as an RA on their advisor's research grant, as a trainee on a training grant, or as an NSF fellow. If a training grant or fellowship stipend provides a lower salary than the designated Departmental RA rate, the stipend will be supplemented to the standard RA rate from research grants. In some cases, students benefit from fellowship and training grant stipends that exceed the Departmental RA rate.

Subject to the availability of funds and continued satisfactory progress in the program, Ph.D. students can expect financial support from Departmental resources for a period of up to six years. After six years, students may be supported from research grants at their advisor's discretion.

All graduate students are eligible for the Graduate Appointee Insurance Program which provides medical, dental, and vision coverage. Enrollment is in September (http://www.washington.edu/admin/hr/benefits/insure/gaip/index.html).

Teaching

Developing good teaching skills is an important part of graduate training. All students are required to teach two laboratory courses in Microbiology. Generally, students teach in the Spring quarter of their first year and one quarter in their second year, but other arrangements are possible so long as the two-quarter teaching requirement is met by the end of the second year. The Lecturer or other faculty member responsible for the laboratory course will prepare a written evaluation of the student's teaching performance to be placed in the student's file. Besides the two-

quarter laboratory teaching requirement, all students are required to present at least two lectures in an undergraduate course in their third or fourth years. Arrangements for giving these lectures can be made by contacting individual faculty members. This requirement can also be fulfilled by presenting lectures in the undergraduate methods course (e.g. Micro 431, see Mark Chandler).

Seminars

All graduate students are required to sign up for and attend Journal Club (Microm 522) and the Departmental seminars on Tuesdays at 4:00 (Microm 520). Students at FHCRC or Rosen may choose to attend seminars at either the UW or FHCRC to fulfill the seminar requirement. Graduate students are not scheduled to present papers at Journal Club until their third year.

Training in Responsible Conduct of Research

In the winter quarter of their first year, Microbiology graduate students are expected to take the "Ethics 101" course co-taught by the Biochemistry and Microbiology Departments. In the event of a scheduling conflict during the first year, this requirement can be met by attending the course in the Winter quarter of the second year. For those students who are awarded a position on an NIH training grant, they will, in addition, be required to attend the assigned number of sessions in the Biomedical Research Integrity (BRI) series (offered annually in the summer by the Department of Bioethics and Humanities).

Ph.D. Supervisory Committee

A well balanced committee is of tremendous benefit to the students and their advisors. At the beginning of the second year, a five person Ph.D. Supervisory Committee is appointed as follows:

1) Adviser must be Microbiology Faculty
2) Member Microbiology Faculty
3) Member Microbiology Faculty
4) Member Microbiology Faculty or Faculty member outside of the department
5) GSR outside of the Microbiology Department

At least two of the five committee members in addition to the GSR must be members of the graduate faculty. The make-up of the committee, including a recommendation for the GSR, is determined by the student and her/his advisor with final approval by the Graduate Policy and Advising Committee and with input from the Graduate Admissions Committee. The student should forward his/her suggestions for the composition of the Supervisory Committee to the Graduate Program Academic Advisor (Sarah Mears) by the first Monday in November of the second year (also see Topics Qualifying Exam below).

Vacation and Leaves of Absence

With regard to vacation time, the Microbiology Department adheres to the policies stated in the UW/UAW Union contract (http://www.washington.edu/admin/hr/laborrel/contracts/uaw/contract/preamble.html). Graduate students are entitled to four weeks (20 business days) of vacation during a 12 month academic period. "Vacation time off shall be taken during academic quarter breaks or as otherwise mutually agreed to by the ASE (student) and his/her supervisor" (Article 31 of contract). Importantly, students should discuss their vacation plans with their advisors well in advance of the proposed time off.

Article 16 of the Union contract spells out the policies for leaves resulting from personal illness or disability, or for the care of a family member or childbirth. In brief, students are entitled to paid leave for illnesses of 7 days per academic year and unpaid leave for up to 12 weeks for illness or childbirth. See Union contract for additional details.

Under unusual circumstances, a student who is in good academic standing and making normal progress in research may apply for an unpaid leave of absence from graduate school for up to a year, subject to approval by the student's mentor and the Graduate Program Coordinator. The student may re-enroll in the program at any time during the leave period. It should be understood that during such an absence, other members of the lab may continue the student's research and upon returning, the student will likely have to redefine her/his research project.

Guidelines for Ph.D. Thesis Supervisory Committee Meetings

Research by its very nature is not always predictable and cannot be rigidly programmed. In addition, it is not always possible to anticipate potential problems at the outset. However a general series of guidelines seems appropriate to provide both students and faculty a set of benchmarks against which student progress can be measured. Under normal circumstances, a student will complete all of the requirements for the Ph.D. degree in approximately 5 years. The following are the recommendations of the Graduate Policy and Advising Committee for monitoring the satisfactory progress of graduate students towards completion of their Ph.D. thesis requirements. It is the responsibility of both the student and advisor to see that the annual meetings are scheduled. After each committee meeting, a member of the student's committee other than the advisor will prepare a short report that is distributed to the members of the committee and the student, and a copy is placed in the student's file.

Meetings within the second year. The first meeting of the Supervisory Committee with the student occurs during Spring quarter of the second year at the time of the

presentation of the Topic Qualifying Exam (see below).The deadline for completing the Topic Exam is May 15.

It is recommended that a second meeting occur in the Summer of the second year. At this meeting the committee will review the course work with the student to ensure that Departmental requirements have been met and the Graduate School requirement of 18 graded credits has been fulfilled. The student should submit a brief summary of her/his progress to date to the committee members one week prior to the meeting. The report should include the Specific Aims for the proposal to be written for the general exam. The meeting should begin with a 30-45 minute oral presentation by the student on his/her research progress and future plans. This meeting is not an exam but rather should focus on the student's progress and future plans to help the student prepare his/her research proposal during the summer. If a student with the concurrence of her/his advisor decides not to call a summer committee meeting, the student should plan to meet individually with committee members to discuss her/his research progress to date and future directions prior to writing the research proposal for the General Exam.

Meeting for the oral component of the General Exam. This meeting occurs early in the Autumn quarter of the third year (prior to November 15th). See Appendix 2 for format.

Meeting at the end of the third year. In the Spring or Summer quarter of the third year, the student will meet with the Supervisory Committee to review his/her progress since the oral exam. One week prior to the meeting, the student will provide the committee with a 2-3 page written progress report. In the report, there should be an indication to the committee as to where the research stands in relation to a first publication. Although the expectation is that a student's thesis research will be published in 2-3 (or more) peer-reviewed papers, the formal requirement of the Microbiology graduate program is that the student be the first author on at least one paper which is published (or in press) in a refereed journal. Ideally at this meeting the student will have a working outline for a manuscript. The student, with the help of the supervisory committee, will discuss the immediate directions of the research in the context of the overall research plan, as described in the original proposal for the oral exam. Any redirection of the research or serious problems should be discussed. Any deficiencies or problems identified at the time of the oral exam will be reviewed with the student at this meeting.

Meeting at the end of the fourth year. The student should provide the Supervisory Committee with a 2-3 page written progress report and copies of any publications (or in-press papers) one week prior to the meeting. By this time, the student is expected to have at least one first author paper published or in press and another manuscript in progress. The meeting will therefore center around discussions relating to the completion of the thesis research, particularly in the context of how the work will be published. The student should provide an outline of the experiments needed to be carried out during the final year. If the student plans to finish up in 3-6 months following

this meeting, he/she should provide an outline of the proposed thesis and seek approval from the committee to begin writing the thesis at that time (see below for 5th year).

Meeting at the end of the fifth year (or just prior to writing the thesis). At this meeting the progress report should include a detailed outline for the thesis. The time line for completion of the thesis and for the Final Exam should be presented. Approval of the committee is required prior to the writing of the thesis. If additional experiments are deemed necessary by the Committee, this is the time to inform the student, not at the end of the Final Exam (see below) Ideally 2-3 first author papers should be published or submitted for publication. Any problems with progress towards completion of the thesis research should be addressed at this time. If progress is marginal, the committee should spell out what must be accomplished over a defined time frame for the student to avoid final probation and/or dismissal with a Master's degree.

Meeting at the end of the sixth year. If the student is still not finished at this point, the supervisory committee will consider two alternatives at this meeting.

a. The student should provide a firm date for the defense and provide a final thesis outline. Unless there are extenuating circumstances, laboratory research should be completed by the end of the summer quarter following the meeting.

b. In the event the research progress has not been satisfactory, the supervisory committee can place the student on final probation or immediately dismiss the student with a Master's degree.

Format for Ph. D. Thesis

As outlined above, a proposed outline of the thesis must be reviewed and approved by the Supervisory Committee prior to the beginning of writing. The typical Ph.D. thesis is organized into the following chapters: Introduction (overview of the field and rationale for the thesis research), Materials and Methods, one or more Results chapters (each with its own brief introduction, results, and discussion sections), and a Future Directions chapter. If any of the thesis research has been published, the papers can be reformatted as is, for inclusion in the thesis. Whether the Materials and Methods for several "papers" are collected into one chapter or left in each "paper" chapter is a matter of personal choice, but often it is desirable to place all of the methodological information in one chapter to avoid excess redundancy. In the event that a published paper contains work carried out by another researcher, only the experiments done by the student should be included in the thesis. For continuity, a summary of related work done by others may be included with proper citations.

The Graduate School does not require a particular format for Ph.D. theses, but does provide the "Style and Policy Manual for Theses and Dissertations" (http://www.grad.washington.edu/stsv/stylman/policy_style2008revision.pdf) as a set of guidelines for preparing a thesis. However at the time of final submission, the following

pages will be checked for accuracy by the Graduate School: Title page, Signature page, Quote slip, Abstract, and Copyright page (if required). See the Graduate School guidelines for the proper formatting of these pages. The remainder of the thesis should be prepared with one inch margins using Ariel 11 font. Figures should prepared in the same way as for journal publication and be included in the text near the point where they are cited and with an accompanying figure legend. Figures can be presented singly on a separate page or imbedded within the text, but if included within the text the size should be adjusted so that the data are clearly visible. During the preparation of the thesis and prior to final submission, the student's advisor should be consulted concerning overall style and presentation. The advisor's signature on the submitted copy affirms that she/he not only approves the content, but also the style of the thesis.

Final Exam

For the Final Exam (thesis defense), the student presents a public seminar on her/his Ph.D. thesis research (see table of Deadlines below). The student's advisor, the GSR, and at least two additional members of the Supervisory Committee must be present at the Final Exam. At the end of the seminar, the Supervisory Committee and the public are invited to ask questions. It is the prerogative of the Committee whether or not they continue to question the student in private. After the Final Exam, the student submits the completed thesis to the Graduate School.

General Guidelines for a Non-thesis Master's Degree

Although the Department does not admit students specifically into a Master's degree program, occasionally a student will leave the Ph.D. program with a Non-thesis Master's degree. The specific requirements for the Master's degree are determined by a three-person Master's committee composed of the student's research advisor and two additional members of the Microbiology faculty. The student should have fulfilled the course requirements for the Ph.D. degree and will generally have done the usual rotations required of a first year student. Typically the student will carry out research for a minimum of 3 additional quarters and present a 2-3 page written report (or manuscript for publication) to the committee one week prior to an oral presentation of his/her work. A student who does not pass the General Exam will generally have satisfied these requirements and will be granted a Non-thesis Master's degree.

Summary of Deadlines for Microbiology Graduate Students			
Year(s)	Quarter(s)	Date(s)	Event
First	Autumn	Early November	Submit NSF fellowship proposal
	Spring	End of quarter	Choose an advisor
	Summer	End of quarter	Complete BRI Lecture series
Second	Autumn	First Monday in November	Submit Topics proposals and Committee suggestions
	Spring	May 15	Topic Qualifying Exam
		Check deadline	CMB Training Grant application
		End of quarter	Complete TA requirement; complete 18 graded credits
	Summer	End of quarter	Schedule committee meeting (or meet individually with committee)
Third	Autumn	Before November 15	Oral component of General Exam
	Spring/Summer	End of summer quarter	Schedule committee meeting
Fourth and beyond	Spring/Summer	End of summer quarter	Schedule committee meetings
	Final Quarter	5 weeks prior to Final Exam	Appoint Reading Committee (3 members of Supervisory Committee)
		4 weeks prior to Final Exam	Submit thesis to Reading Committee
		3 weeks prior to Final Exam	Submit request for Final Exam
		2 weeks prior to the end of the quarter (strongly recommended)	Final Exam: thesis seminar/defense

Appendix 1: Format for the Topic Qualifying Exam

Purpose

The objectives of the Topic Qualifying Exam are for the student (i) to gain an understanding of a topic area unrelated to his or her thesis research, (ii) to present a critical written review of previous work and devise a logical plan for future research directions in the topic area, and (iii) to effectively present the topic and respond to questions in an oral setting.

Procedures

In preparation for the topic exam in the Spring, second year students should submit two topic proposals to the Graduate Policy and Advising Committee by the first Monday in November. For each proposed topic, provide a title and a designation of the topic area. If it is not obvious, the student should provide a one or two sentence explanation as to why the topic choice is outside the student's thesis topic area. As a guideline, topic areas are defined as follows: bacterial pathogenesis, computational biology, astrobiology, environmental microbiology eukaryotic cell biology, fungal pathogenesis, parasitology, immunology, genomics and proteomics, bacterial physiology and genetics and virology. In addition, for each topic, the student should provide a one paragraph statement briefly outlining the focus for the proposed topic and including two recent references that serve as the basis for the topic to be explored. It is not necessary at this point to indicate the proposed future directions of the proposal. The Policy and Advising Committee will review the proposed topics and either approve both topics (in which case the student can choose), select one of the two, or request two new topics for review.

The exam is administered by the student's Ph.D. Supervisory Committee plus one additional faculty member who is an expert in the topic area and who is approved by the Graduate Policy and Advising Committee. If an additional faculty member is not available in the Microbiology Department, a faculty member from another department may be asked. After the Ph.D. Supervisory Committees are appointed (December of second year), the student, after consultation with his/her advisor should submit two names to the Graduate Policy and Advising Committee for consideration as the additional member of the examining committee.

The topic examination will consist of two parts to be completed by May 15th of the second year. The first part will be a critical written review of the topic with three sections: an introduction and background section (2-3 pages), a section describing the current state of the field that is based on the selected results from 2 or 3 key recent papers (2-3 pages), and a future directions/research plan section identifying critical unanswered questions and approaches to addressing them (1-2 pages). All three sections of the paper should include suitable references to the literature. The research plan should be hypothesis-driven and based on 1 or 2 specific aims. The research and

writing of the topic paper should take approximately a month during which time the student is expected to maintain at least a low level of research activity. The paper should be submitted to the committee two weeks prior to the scheduled oral presentation. Within one week, the committee members will read the paper and individually provide feedback to the student. The student will then have one week to respond to any criticisms, improve the paper (if necessary), and resubmit it to the committee before the oral presentation.

The second part of the Topic examination will be oral. The presentation must be given at a time scheduled to allow at least four members of the student's committee, plus the additional member, to attend. The GSR may be invited but need not attend. A member of the committee other than the student's advisor will be chosen as the chairperson of the meeting. The oral presentation should last from 30 to 45 minutes, with allowances for interruptions, followed by questions. The entire exam should not exceed 90 minutes.

Evaluation

The student will be evaluated on the organization of the presentation, critical analysis of the 2-3 papers discussed in depth, clarity of the discussion of experiments and future directions, and the effectiveness of the presentation style. While a highly developed and innovative research plan section is desirable, it is recognized that this is still a formative area for a second year student, and therefore the third section of the paper should be weighted less in comparison with the background and current research sections. Feedback to the student will be provided immediately after the exam by the examining committee. If the performance is considered to be unsatisfactory, the committee may require the student to repeat some or all aspects of the topic and presentation prior to proceeding to the thesis research proposal and oral exam. The chairperson will provide a written evaluation that will be distributed to the student and other members of the committee and placed in the student's file.

Appendix 2: General Examination Format

Written Research proposal

The written research proposal on the students' thesis work should follow the format specified for an NIH grant application and be 10-12 pages in length**.** This proposal should be prepared during the early part of the Autumn quarter of the third year. See Appendix 3 for a set of guidelines for writing the proposal entitled "Suggestions for Preparation of Research Proposals for General Exam". The student should present a draft of the proposal to her/his advisor at least three weeks prior to the oral exam. The advisor will critique the draft proposal with the student and indicate any sections that need rewriting. However, the advisor will not participate in a substantive way in the writing process. One week prior to the oral exam, the final version of the proposal will be given to each member of the student's Supervisory Committee.

Format for the oral exam

1. Prior to beginning the oral exam and in the absence of the student, the advisor will review the student's academic record and give the Supervisory Committee members a written evaluation of the student's research performance and potential. The advisor should have discussed the evaluation with the student prior to the exam. The evaluation should include an overall assessment that includes the student's effort level, creativity, independence, lab techniques, ability to design and execute experiments, and ability to communicate.

2. The oral exam is chaired by a member of the Supervisory Committee other than the advisor or the GSR. The advisor will not examine the student but will be present and available for comment or clarification when needed.

3. The exam begins with a 30 minute oral presentation of the research proposal by the student summarizing his/her research progress and indicating future directions of the research in relation to the proposed Specific Aims. Although the length of the presentation is limited to a maximum of 30 minutes, an allowance will be made for interruptions by committee members who ask clarification-type questions. Following the oral presentation, members of the Supervisory Committee other than the advisor will examine the student. Although the research proposal will provide the starting point for the oral exam, the questioning can extend into related topics, including experimental techniques. The meeting may last up to three hours total.

Final evaluation

At the end of the oral exam, both the student and the student's advisor will leave the room. This allows the committee to discuss the performance of the student in the absence of the advisor. The outcome of the general exam will be determined solely by

the committee members in the absence of the advisor. At the end of the deliberations, the student's advisor is appraised of the outcome in the absence of the student. Finally the student will be called back into the room and members of the committee will provide feedback to the student on his/her performance.

The decision made at the end of the oral exam is a cumulative one, taking into account the student's performance in all areas since entering graduate school. These include, in the order of relative importance: (1) the performance on the oral exam in the area of the student's research, (2) the quality of the research proposal, (3) the advisor's written evaluation of research progress and potential, (4) the performance on the Topic Qualifying Exam, and (5) the performance in course work.

The final decision must be one of the following: Pass, Fail, or Re-examine. If the committee feels deficiencies exist that need to be corrected, the “Re-examine” option must be chosen rather than awarding a “Pass” with stipulations concerning the deficiencies. A "Fail" means the student must leave the Ph.D. program, generally with a Non-thesis Master's degree. A written summary of the Committee’s decision prepared by the member of the committee who chairs the exam will be placed in the student’s file.

Appendix 3: Suggestions for Preparation of Research Proposals for General Exam (excerpts from NIH Guidelines with modifications)

Developing the Hypotheses

- A good grant application is driven by a strong hypothesis (or hypotheses). The hypothesis is the foundation of your application. Make sure it's solid. It must be important to the field, and you must have a means of testing it.
- Provide a rationale for the hypothesis. Make sure it's based on current scientific literature. Consider alternative hypotheses.
- State your hypotheses in both the specific aims section of the research plan and the abstract.

Specific Aims

- Your specific aims are the objectives of your research project, what you want to accomplish. The project aims should be driven by the hypothesis you set out to test or the questions you are asking. Make sure they are highly focused.
- Begin this section by stating the general purpose or major objectives of your research. Be sure all objectives relate directly to the hypothesis you are setting out to test. If you have more than one hypothesis, state specific aims for each one (or a specific aim may address how you would distinguish two alternative hypotheses). Keep in mind your research methods will relate directly to the aims you have described.
- State alternatives to your hypothesis and explain why you chose the one (or more) you selected or how you will distinguish between alternative hypotheses.
- Choose objectives that can be easily assessed by the reviewers. Do not confuse specific aims with long-term goals.

Background and Significance

- Keep the statement of significance brief. State how your research is innovative, how your proposal looks at a topic from a fresh point of view or develops or improves technology.
- Show how the hypothesis and research will increase knowledge in the field. Relate them to the longer-term, big picture scientific objectives and to the betterment of public health.
- Justify your proposal with background information about the research field that led to the research you are proposing. The literature section is very important because it shows reviewers you understand the field and have a balanced and adequate knowledge of it.

- Use this opportunity to reveal that you are aware of gaps or discrepancies in the field.
- Identify the next logical stage of research beyond your current application.

Preliminary Studies/Progress Report

By providing preliminary data, this extremely important section helps build reviewers' confidence that you can handle the technologies, understand the methods, and interpret results.

- Preliminary data should support the hypothesis to be tested and the feasibility of the project.
- Explain how the preliminary results are valid and how early studies will be expanded in scope or size.
- Make sure you interpret results critically. Showing alternative meanings indicates that you've thought the problem through and will be able to meet future challenges.
- Preliminary data may consist of your own publications, publications of others, unpublished data from your own laboratory or from others, or some combination of these.
- Include manuscripts submitted for publication. Make sure it's clear which data are yours and which others reported.

Research Design and Methods

Describe the experimental design and procedures in detail and give a rationale for their use. Organize this section so each experiment or set of experiments corresponds to one of your specific aims and is stated in the same order. Even holding to this structure, the experiments still must follow a logical sequence. They must have a clear direction or priority, i.e., the experiments should follow from one another and have a clear starting or finishing point. Provide alternative experimental approaches where appropriate. Discuss potential pitfalls and how they will be addressed. Consider the possible different outcomes from your experiments and how the results will be interpreted.

Appendix L

Undergraduate Program

Admission Requirements

General Admission: Most students apply to the undergraduate program during the 3rd Quarter of their sophomore year, and should meet the following requirements:

- a minimum of 75 transferable credits, including;
  - o BIOL 180, 200, 220.
  - o CHEM 142, 152, 162, or 145, 155; and CHEM 237, 238, 239 or CHEM 223, 224 or Honors CHEM 335, 336, 337.
- a cumulative grade point average (g.p.a.) of 2.0 overall.
- a cumulative g.p.a. of 2.25 in the prerequisite biology and chemistry courses.

Early Admission to the Program: Students who meet the following criteria may apply for early admission to the Microbiology Program:

- BIOL 200
- Full year of the Inorganic Chem: CHEM 142, 152, 162 or honors series
- First quarter of either the two or three quarter series in Organic Chem CHEM 223 or 237 or 335H
- a cumulative g.p.a. of 2.75 in the prerequisite biology and chemistry courses.
- a cumulative grade point average (g.p.a.) of 2.0 overall

Evaluation of other science courses such as math and physics will also be considered at the time of application.

Most students who make application to the department have completed most of their biology and organic chemistry prerequisites needed for graduation.

Degree Requirements

To graduate a student must meet University, College of Arts and Sciences, and Departmental requirements. The University requires a minimum of 180 credit hours with a cumulative GPA of 2.0. Of these 180 credits, 90 credits are required for the Microbiology Major.

The Department offers or participates in 4 undergraduate programs:

BACHELOR OF SCIENCE IN MICROBIOLOGY:

Prerequisites (39 credits):

Biology (15 credits/1 year sequence)
Biol 180, 200, 220

Chemistry (24 credits)
Inorganic:
Chem 142, 152, 162
Organic:
Chem 223, 224
or
Chem 237, 238, 239
or
Chem 335, 336, 337 (honors)

Departmental Requirements (55 credits)

Microbiology: (36 credits)
Microm 410 Fundamentals of Micro (3)
Microm 411 Gene Action (5)
Microm 412 Fundamentals of Micro (3)
Microm 402 General Micro Lab (3)
Microm 431 Recombinant DNA Lab (3)
Microm 441 Immunology (4)
Microm 442 Medical Bacteriology (3)
Microm 443 Medical Micro Lab (3)
Microm 496 Library Research (2)
Microm 445 Medical Virology (2) or
Microm 450 Molecular Biology of Viruses (3)
Approved Electives (4-5 credits)

Biochemistry: (6 credits)
Bioc 405, 406 (3,3)
or
Bioc 440, 441, 442 (4, 4, 4)

Physics: (8 credits)
Phys 114, 115 (4,4)
or
Phys 121, 122 (4,4)

Mathematics: (5 credits from the following options)
Math 112, 124, 127, 144, Q. Sci 381, Stat 311

Grade Requirement:

All courses taken to fulfill requirements must be taken for a letter (numerical) grade unless offered credit/no credit. Students must maintain a cumulative GPA of 2.25 and a minimum grade of 1.8 in all required Microbiology courses and Microbiology-approved elective courses used towards graduation. Courses for which a grade of 1.7 or less was received must be repeated.

Approved Electives:

Students can select from the following approved elective courses to fulfill graduation requirements. From this list all majors are required to take 4-5 elective credits. Students who have a special area of interest might enjoy and find it beneficial to their career to take a group of related elective courses in one subject area such as: Food Microbiology, Virology, Bioremediation/Environmental, Medical Microbiology Pathogenesis. Approved courses are listed by sponsoring departments.

Microbiology

MICROM 435 Microbial Ecology (Offered even yrs.) Sp (3) Staley
MICROM 444 Medical Mycology and Parasitology Sp (4) Anderson, Fulton
MICROM 445 Virology Sp (2) Lagunoff
MICROM 450 Molecular Biology of Viruses W (3) Champoux
MICROM 490 Aquatic Microbiology Sp (3-5) (Optional Lab) Herwig
MICROM 499 Undergraduate Lab Research A,W,Sp,S (Var) Leigh
MICROM 510 Physiology of Bacteria (Offered odd yrs.)W (3) Traxler
MICROM 530 Advanced General Micro. (Offered even yrs) W (4) Leigh, Staley
MICROM 553 Molecular Mechanisms of Bacterial Pathogenesis (Offered odd yrs) A (3) Ramakrishnan
MICROM 555 Advanced Clinical Microbiology A,W,Sp,S (2.5) Limaye/Fang

Biology

BIOL 401 Cell Biology A,Sp (5)
BIOL 440 General Mycology W (5) (offered even yrs)
BIOL 446 Phycology Sp (5)

Civil and Environmental Engineering

CIVE 461 Biological Problems in Water Pollution W (3/5) (Joint w/Fish 430)
CIVE 462 Effects of Waste Water A (3/5) (Joint w/Fish 434)
CIVE 540 Microbiological Process Fundamentals A (3)

Ecosystems and Conservation

ESC 411 Forest Soil Microbiology A (4) (Offered even yrs.)

Environmental Health

ENVH 430 Methods in Environmental Sampling and Analysis A (3)
ENVH 440 Water and Waste Sanitation A (4)
ENVH 441 Food Protection W (3)
ENVH 442 Vector Control & Housing Sp (3)

Epidemiology

EPI 420 Intro to Epidemiology Sp (3)

Fisheries

FISH 490 Aquatic Microbiology Sp (3-5)

Genome Sciences

GENOME 371 Intro Genetics A,W,Sp (5) or
GENOME 372 Gene Structure and Function W,Sp (5)

Medical Chemistry

MEDCH 401 Immunizing & Antimicrobial Agents Sp (4)
Medical History and Ethics

MHE 401 Disease and Medicine in History (3)
MHE 417 History of Disease (3)

Oceanography

OCEAN 530 Biological Oceanography W (3)

HONORS PROGRAM: BACHELOR OF SCIENCE IN MICROBIOLOGY WITH DISTINCTION

The Departmental Honors Program allows superior students who are not members of the College Honors Program to participate in the departmental honors curriculum and receive a bachelor's degree "With Distinction in Microbiology," which is noted on the transcript and diploma. Students interested in the program should contact the

Departmental Honors Advisor. An interview may be requested of an applicant prior to formal acceptance.

To qualify for the Departmental Honors Program students must declare Microbiology as a major, and have a 3.3 cumulative grade point average.

Completion of the Honors program requires the student to:

- maintain an overall 3.3 g.p.a., which includes required and elective courses.
- conduct an undergraduate research project (Microm 495 for a minimum of 6 credits), and,
- submit a thesis (Microm 496) based on the research. Paper should include an abstract, introduction, materials and methods, results, discussion, and references. The completed thesis must be read and approved by the research supervisor and one other faculty member identified by the research mentor. Research credit will only be given following submission and acceptance of the thesis (Microm 496).

Members of the College of Arts and Sciences Honors Program may be admitted to the Honors Program in Microbiology during their junior year, or any time prior to that, subject to faculty approval, providing they have an overall GPA of 3.3. They must fulfill the requirements of the College of Arts and Sciences Honors Program and complete satisfactorily the Honors requirements of the Microbiology Department. It is advisable that students take 1 or 2 microbiology courses prior to making application to the Honors Program in Microbiology.

DOUBLE DEGREE PROGRAM IN MEDICAL TECHNOLOGY

The Departments of Microbiology and Laboratory Medicine offer a five-year program by which students may obtain a bachelor's degree in Medical Technology and Microbiology.

Microbiology undergraduates who are interested in this program apply to the Department of Laboratory Medicine in the Winter of their junior year.

MINOR IN MICROBIOLOGY

The Microbiology Minor requires students to complete 15 credits in background science courses and 15 credits in microbiology courses with a minimum GPA of 2.0 in each of these two areas:

Background Science Courses

15 credits consisting of Biology (Biology 200, or Biol 161 and 162, or their equivalent) and Chemistry (Inorganic Chemistry 142 or 145 or 155 or 162) and (Chemistry 237, or Chemistry 220 and 221, or their equivalent) courses.

Microbiology Courses
15 credits in 400-level graded Microbiology courses with at least one laboratory course (Microm 402 or 302, 431, 443), Microm 410 and Microm 496M (Thesis for Micro Minors) are also required.

Students are encouraged to choose their own course of study; below are suggested options for students who wish to have a focus to their Minor. These include, but are not limited to:

Molecular Microbiology

Micro 410 (3 credits, Fall)
Micro 402 (3 credits, Fall/Spring)
Micro 411 (5 credits, Winter)
Micro 431 (3 credits, Winter)
Micro 450 (3 credits, Winter)
Micro 496 M (2 credits, F,W,SP,S)

Medical Microbiology

Micro 410 (3 credits, Fall)
Micro 441 (4 credits, Fall)
Micro 442 (3 credits, Winter)
Micro 443 (3 credits, Fall/Winter)
Micro 444 (4 credits, Spring) and/or
Micro 445 (2 credits, Spring)
Micro 496 M (2 credits, F,W,SP,S)

Environmental Microbiology

Micro 410 (3 credits, Fall)
Micro 402 (3 credits, Fall/Spring)
Micro 412 (3 credits, Spring)
Micro 435 (3 credits, Spring, Even years)
Micro 496 M (2 credits, F,W,SP,S)

Virology

Micro 410 (3 credits, Fall))
Micro 443 (3 credits, Fall/Winter) or
Micro 302 (2 credits, F,SP,S)
Micro 450 (3 credits, Winter)
Micro 445 (2 credits, Spring)
Micro 442 (3 credits, Winter)

Micro 496 M (2 credits, F,W,SP,S)

Research Opportunities

Microm 499:

Microm 499 offers the opportunity to learn current laboratory technology essential for industry or graduate school, and to participate in scientific research at the conceptual and technical levels. Microm 499 can therefore be a very rewarding experience, however it is a demanding and time -consuming endeavor. It is not for everyone, and for this reason is not required of microbiology majors.

Consider carefully your ability to commit the necessary time and effort before deciding to do a Microm 499 project. It is expected that students will register for 2-3 credits of Microm 499 for AT LEAST 2 quarters (1 credit is equal to 3 hrs per week). Students should expect to spend a minimum of 6-10 hours per week in the laboratory, and should be somewhat flexible with regard to scheduling time in the lab. In most cases Microm 499 students begin their work in their senior year, and are typically supervised by graduate students or post-docs. Normally, Microm 499 students will also register for Microm 496, Library Research, with the 499 advisor.

There are two ways to go about identifying a research mentor. You can go directly to one or more faculty member(s) with whom you might be interested in working, or you can schedule an appointment with Dr. John Leigh (E-311, 685-1390, leighj@u.washington.edu) who oversees the Undergraduate Research Program, to discuss research opportunities and availability of specific faculty members to sponsor students. Prior to meeting with potential faculty mentors it is recommended that you look over some of the publications of that laboratory.

Please be aware that not every laboratory may have an opening for a 499 student. Try to arrange your Microm 499 as far as possible in advance (1-2 Quarters) of the quarter you wish to begin. Once you have been accepted into a laboratory for Microm 499, contact Sarah Mears, Advisor, to obtain an entry code to register for the course. A C/NC grade is given for each Quarter of research. Most research mentors require that the results of your study be written up as a research report; Microm 496 can be used for this purpose.

Undergraduate Research in any department may be used as an elective, provided the research project has the prior approval of the Undergraduate Research Advisor. Petition forms are available in Sarah Mears' office.

Other research opportunities and information may be obtained from the University's Undergraduate Research Program Office (urp@u.washington.edu).

Microm 495:

College of Arts and Science Honors and Microbiology with Distinction students are required to carry out a research project (Microm 495). The procedures for identifying a research mentor and the necessary time commitments are similar to those for Microm 499, as described above. The major difference is that Microm 495 students will receive research credit only upon submission and acceptance of their research paper (Microm 496), and the research paper must be read by the research mentor and another faculty member (identified by the research mentor).

Appendix M

Department of Microbiology
Undergraduate Program Exit Survey

We are constantly trying to improve our undergraduate program and we're asking for a few minutes of your time to help. As one of our microbiology majors, your constructive comments on our program are particularly valuable. Please take the time to help us, and future students, by completing the survey. Congratulations on your impending graduation!

Part I. Questions concerning the microbiology coursework/faculty

Which microbiology course(s) and faculty member(s) did you find the most enjoyable, interesting, and/or challenging? Why?

Are there any courses you feel need improvement or revision? Please include your suggestions for improvements/changes.

Are there any courses, which should be deleted from or added to our current requirements? Please explain.

Do you feel that our current grade standards are adequate? (1.8 minimum in each course, 2.25 cumulative GPA)

Do you have any suggestions for additional courses you would like to see offered by the Department?

Did you have a job while you were taking your microbiology classes? If so, approximately how many hours per week did you work?

What have you gained most, personally and academically, having selected Microbiology as your undergraduate major?

Part II. Questions concerning the Microbiology Academic Advising

How often did you email, visit, or call the Microbiology Advising Office?
_____two times or less (to declare a major and to apply for graduation)
_____three to five times
_____more than 5 times

How do you rate the services of the Microbiology Advising Office?
_____indispensable
_____very valuable
_____worthwhile
_____inconsequential
_____not helpful

Were you assigned a faculty advisor and, if so, whom? How often did you meet with your advisor?

Do you have any suggestions to improve our undergraduate advising?

Part III. Questions concerning your future plans

What are your plans following graduation?

_____enter the job market (please fill out part A on the following page)
_____enter graduate school (please fill out part B on the following page)
_____enter a health professional school (please fill out part C on the last page)
_____undecided (please fill out part D on the last page)
_____other (please specify)

Part A. For students intending to enter the job market:

Which careers interest you?
_____biotechnology
_____environmental
_____medical
_____food/drug production
_____other (please specify)

What departmental courses or faculty helped or influenced your career decision? Explain.

Did you use the employer information available in the department? If so, was it helpful?

Have you applied for a job yet, and if so, have you been offered a position?

Did you participate in an undergraduate research program (Micro 499 or 495)?
If no, why not? If yes, which lab?

Do you feel that your degree program has prepared you for your desired career, and if not, do you have any suggestions for improvements?

Part B. For students intending to enter graduate school:

To which department/schools have you applied?

Did you participate in an undergraduate research program (Micro 499 or 495)?
If no, why not? If yes, which lab?

Do you feel that your degree program has prepared you for your desired career, and if not, do you have any suggestions for improvement?

Part C. For students intending to enter a health professional program:

To which program(s) do you intend to apply/enter?
_____medical
_____physician's assistant
_____nursing
_____physical therapy
_____dental
_____other (please specify)

To which schools have you/will you apply?

Do you feel that your degree program has prepared you for your desired career, and if not, do you have any suggestions for improvement?

Part D. For students undecided about career goals:

Do you believe that the department did an adequate job providing information about career opportunities and, if not, do you have any suggestions for improvement?

Appendix N
Schematic Design of J-Wing Remodel

University of Washington
Microbiology Remodel
Magnuson Health Sciences Center, J-Wing