PERSONAL STATEMENT EXAMPLE

TENURE TRACK ASSOCIATE PROFESSOR

TO

TENURE TRACK PROFESSOR

TT - Assoc. - Full

August 15, 2013

Georgia Institute of Technology

BIOL 6611 – Advanced Microbial Physiology (Spring 2003, Spring 2004). As an assistant professor at Georgia Institute of Technology, my first course was Advanced Microbial Physiology for graduate students. I taught this course as an advanced literature survey course covering the most recent advances in the subject area. I taught the course both in Spring 2003 and Spring 2004. Students presented papers with the goal of learning how to analyze the literature from hypothesis to experimental design to scientific writing. Papers in the hottest areas with the largest impact as well as some papers with major flaws were presented to illustrate the best and the worst in the literature. Papers from various journals were included to demonstrate the range of quality and impact on the field as well as differences in content and style. During the 2004 version of the course, I gave exams such that the students were required to do in-depth analysis of each of the papers discussed, in addition to those papers that each student was required to present in class. As a result the class was engaged. In addition, I required "chalk talks" rather than PowerPoint presentations to emphasize students' ability to think on their feet. The students' grades were based on their oral presentations and on their ability to synthesize information from papers in the form of written exams. I received excellent ratings by the students from these courses and was nominated anonymously (by someone in the class) and won the Georgia Institute of Technology campus wide Dean Griffin Day "**Go the Extra Mile Award**" in 2004.

Contact hours: 45 per semester

BIOL 4390 – Microbiology Project Laboratory (Fall 2004). An informal survey of students who previously took the "Micro project lab" course and a survey of those instructors who had recently taught the course led me to develop an entirely new approach for teaching the project laboratory for the Fall 2004 semester. The idea to start and finish one specific, hypothesis-driven experiment evolved after analyzing the needs of the students and the goal of such a course. The main objectives included teaching the students to formulate a hypothesis and design an experiment that would test such a hypothesis. The implementation of this idea was more effective with all students doing similar experiments on the same organism but with different genes. Thus, the project became a global analysis of orphan chemoreceptors on the *Myxococcus xanthus* genome. I had 23 students divided into 11 groups. During the semester, the students carried out all steps necessary to subclone a gene fragment that would enable construction of knockouts in the parent. Their projects were, in essence, equivalent to a rotation project in the lab. Each group subcloned a different chemoreceptor gene from the *M. xanthus* genome. None of those genes had been studied in any laboratory. *As a result of the project having been a large success, their work was presented as a poster at the American Society for Microbiology General Meeting in June, 2005.* Each of the students was a co-author on that poster. Hsu-Ming Wen was a student in that course, subsequently joined my laboratory, and defended the poster at the ASM meeting. In order to measure the students understanding of the concepts, I gave quizzes throughout the semester testing each aspect of the various techniques and relevance to the overall experimental design. I tested the students at all levels, from the details of the reaction buffers to analysis of recombination events to the behavior of the organism under standard laboratory conditions. The students performed every task from PCR to microscopy. They submitted reports in the format of a *Journal of Bacteriology* paper.

Contact hours: 45

BIOL 3380 – Introduction to Microbiology (Spring 2005, Fall 2005, Fall 2006). As mentioned above, a preliminary survey of the student's level of understanding of basic microbiology allowed me to design a course to be more highly focused on a modern molecular understanding of prokaryotes. I gave all lectures as "chalk-talks" and presented the perspective of *E. coli* as a prototypical bacterial cell. Material included genetics, replication, metabolism, and cell biology. The students took quizzes, exams, and a final to determine their grade. Evaluations of my teaching by the students were excellent.

Contact hours: 45 per semester

BIOL 7001 – Foundations in Molecular Biology (Fall 2005, Fall 2006). As part of the Molecular Cell group in the School of Biology, I helped design and participated in a team-taught Foundations course for two semesters (Fall 2005 and Fall 2006). I gave eight lectures on signal transduction in microorganisms with the major emphasis on experimental design and testing of hypotheses. I presented the vast majority of the material as a "chalk-talk" but supplemented lectures with movies, photographs, and experimental results from the literature. The course was taught to prepare incoming graduate students for a successful career in molecular and cell biology laboratories.

Contact hours: 15 per semester

Teaching at Cold Spring Harbor Laboratory:

Cold Spring Harbor Laboratory – Advanced Bacterial Genetics (2006 – 2010). I was one of three instructors for the "Delbrück Phage Course", now known as Advanced Bacterial Genetics. Last year was the final year of a 5-year commitment. The course is taught every June and is comprised of 16 students including senior graduate students, postdoctoral fellows, and professors. The students are an elite group selected from around the world. The intellectual environment is unique and extraordinary. The experiments are designed to teach the power and logic of genetics and expose the students to unique aspects of microbial systems. For this course, all instructors give chalk talks. The course runs for 21 consecutive days and is, in essence, boot camp for bacterial genetics. Total contact hours are approximately 250 to 300 for the course. The ABG course has an incredible legacy in microbiology. Being an instructor at CSHL was a great way to represent The University of Iowa among an elite international group of scientists. In 2009, we successfully renewed the NSF grant supporting the course (it was the top grant in the panel). The grant provides salary support and supply money through 2014.

Impact:
The Advanced Bacterial Genetics Course and its association with Cold Spring Harbor Laboratory has played a prominent role in Microbiology. Last year, I was lucky enough to be interviewed for the Podcast, "A Mecca for Microbiology" for the series, "*This Week in Microbiology*", hosted by Vincent Racaniello to discuss the impact of the ABG course in the history of Microbiology. It is worth noting that a postdoctoral fellow from Belgium took the course this summer (2013) and told me that she signed up because of what she heard on that podcast.

Teaching at The University of Iowa:

Microbiol Physiology (061:160/260) (Spring 2007, 2008).
I taught one third of the lectures for this team-taught class in 2007 and 2008 and was the course coordinator for Spring 2008. I gave all lectures as "chalk-talks" and presented various examples of unique elements of bacterial physiology that are atypical with respect to *E. coli*. In essence, I introduced the students to bacterial diversity from the point of view of physiology as the driving force for the observed diversity. I covered material ranging from motility and signal transduction to sugar transport and biofilm formation. I gave essay style quizzes to determine the level of comprehension by the students. Evaluations of my teaching by the students were excellent.

Contact hours:
2007 15 for lectures
2008 15 for lectures (10 additional hours as director)

Bacterial Diversity (061:179/279) (Fall 2008, 2009, 2010, 2011, 2012, 2013):
I am currently teaching Bacterial Diversity with emphasis on the latest findings in the area of bacterial diversity. I am giving all lectures as "chalk-talks" and presenting various examples of unique elements of gene regulation, physiology, and development that are not typical for (or only recently identified in) *E. coli*. I am covering material ranging from riboswitches to toxin-antitoxin systems, biofilms to quorum sensing, and conjugation to antibiotic resistance. The students are required to read several papers from the primary literature for each module. The students will be evaluated by analytical essay style quizzes to determine comprehension of the material.

The graduate students write a proposal (NIH R21 format) that may be submitted to NSF for external funding. The graduate students orally defend their proposals in class in order to generate feedback from other students and gain experience for the upcoming oral defense of their written comprehensive qualifying exams.

Contact hours: 45 per semester

Bacterial Diversity Laboratory Section
sat in on my Bacterial Diversity class in 2008 and, together, we developed a set of experiments that have been implemented as the laboratory component accompanying the lecture. The laboratory was designed to augment the undergraduate curriculum and provide an elective for senior undergraduates and incoming graduate students in Microbiology.

Contact hours as director:
2009 15 hours
2010 10 hours
2011 5 hours

Advanced Topics in Prokaryotic Biology (Spring 2012)
This course is designed for graduate students. The goal here is to get students 'up to speed' regarding rigorous analysis of the scientific literature and proposal writing skills. The subject matter for my course was "surface appendages and environmental sensing". I shared the teaching with
who did 25% of the classes. The students presented papers and were interrogated extensively on the interpretation of data, the use of specific methods, and the big picture aspects for project significance.

Contact hours: 36

FUTURE in Biomedicine Program (CCOM)

This summer (2013) I hosted a visiting scholar from Graceland University in Lamoni, Iowa. is an assistant professor at Graceland. She teaches undergraduate microbiology and came here to learn new techniques and establish a collaboration that would be portable to Graceland. I took advantage of my experience at Cold Spring Harbor and set up a project to carry out a transposon mutagenesis screen to identify mutants in M. xanthus that alter its predatory capaci brought an undergraduate student with her, worked each day in the lab and produced a significantly large set of mutants with interesting phenoty will be part of the upcoming manuscript describing our result will be part of the NSF proposal to study microbial networks and her component will be the highlight of our "broader impacts" section for educational outrea took a set of mutants back to Graceland and will continue work over the year with the possibility of returning to Iowa City next summer.

Contact hours: 40

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Research Summary

Our major areas of investigation focus on signal transduction in relatively diverse bacteria ranging from soil dwelling spore formers *(Bacillus subtilis and Myxococcus xanthus)* to biofilm forming pathogens *(Haemophilus influenzae, Neisseria gonorrhoeae, & Staphylococcus aureus).* Work in my laboratory has expanded the understanding of the function of chemotaxis-like (chemosensory) systems and closely related two-component signal transduction systems (TCS) and demonstrated their versatility for regulation of motility and gene expression. We identified the first example of a chemosensory system that regulates gene expression to affect biofilm formation and sporulation and we were the first laboratory to demonstrate a biochemical interaction between a chemosensory system and a prototypical two-component system. We coined the term "predataxis" to describe the ecology of a biofilm destroyer, *M. xanthus*, which utilizes a chemosensory system to regulate its predation upon other species of bacteria. Currently, my laboratory is characterizing several TCS homologs for their role during biofilm formation including MisSR in *Neisseria*, SrrBA in *S. aureus*, and all TCS and chemosensory systems in *M. xanthus*. Our interest in microbial communities has led to an ongoing collaboration with the Calarge lab (Ulowa Psychiatry) where we have obtained pilot funding for investigation of the role of the microbiome in diabetes.

Impact

Our research has led to several publications over the last several years in the *Journal of Bacteriology, Genome Announcements, mBio, PNAS,* and *PLoS Genetics*. Five of our papers have had the accompanying cover photograph for the journal. Most notably, our *PNAS* article on predation was featured in the *New York Times Science Times*, distributed by the Associated Press, and was featured in multiple international science journals including *Popular Science*, a French publication "*Sciences et Avenir*", a Spanish publication "*Muy Interesante*", and a German publication "*Welt der Wunder*". Our work has been highlighted or reproduced in *Nature Reviews Microbiology* (2014) as well as several text books including McGraw-Hill, *Willey: Prescott's Microbiology*, 8th edition (2009), W.W.Norton, *Microbiology* 2nd edition by Slonczewski and Foster (2010), and *Microbial Diversity* (ASM press, 2013).

Our work has led to several reviews on the subjects of bacterial signaling and predation. For the *FEMS Microbiology Reviews*, our work was featured on the cover of 2010 *FEMS Microbiology Letters*. The significance of our work is also evident by invitations for reviews including *Nature Reviews Microbiology* (2007), *BioEssays* (2008) and an *Annual Review of Microbiology* (2009). I was also invited to write a News & Views for *Nature Chemical Biology* (2010). We have also published a book chapter in "*Myxobacteria*: multicellularity and differentiation" (2008, ASM press).

Chemosensory regulation of bacteria development and microbial communities

The central project in my lab is the analysis of regulation of gene expression by chemosensory systems and two-component systems in bacteria, specifically *Myxococcus xanthus*. The majority of the personnel in my lab are working on various aspects of this project. This project is significant because it was the first example of a CheA-like histidine kinase that interacts with a NtrC homolog (CrdA) to regulate gene expression. i overproduced and purified a newly identified interacting kinase, CrdS, and the CrdA response regulator and mutant forms. He performed biochemical assays to assess kinase and phosphatase activity for the CrdSA system and demonstrated its regulation by CheA3. The work opened up a new avenue into similar two-component systems and has resulted in publications in *mBio* (2011), *PLOS Genetics* (2012), and *mBio* (in press). The body of this work also resulted in a new grant from NSF funded by Molecular and Cell Biology via the Systems Biology Panel.

r is characterizing the molecular components of the periplasmic signaling complex for the Che3 chemosensory syster has shown that CrdB is a periplasmic lipoprotein and transmits stress response signals through a membrane bound chemoreceptor to the CheA3 kinase. These results were submitted to *PNAS* and were positively reviewed yet required further experimentation. Following the identification and characterization of CrdS, we are now able to resubmit the CrdB study. This work would be the first description of a lipoprotein that transduces signals through a chemotaxis-like system

Myxococcus xanthus utilizes chemotaxis and signal transduction during its predatory life style. We have published four papers thus far on the topic which were well received by the scientific community (*PNAS, NY Times, FEMS Microbiology Revie* newest finding have significantly advanced our understanding of predation in nature such that we have a new study written for the *Journal of Bacteriology* where we identify a small molecule inhibitor, Bacillaene, that prevents *Myxococcus xanthus* from consuming *Bacillus subtilis*. This work is highly impactful since it reveals the nature of chemical warfare occurring daily in soil ecosystems. As a result we have established concrete collaborations with (Indiana University) and ght (Texas A&M University). We also carried out a mutagenic screen with a visiting scholar, from Graceland University to identify genes regulating *M. xanthus* predatory behavior toward its would-be prey, *B. subtilis*. Those results should lead to several additional manuscripts. The project is being organized into a grant proposal for NSF to examine the "systems biology" of the external chemical network (ab) and its impact on the internal signaling networks governing behavior in *M. xanthus* (our lab) and *B. subtilis* (us and Lab).

Another key project is the characterization of the Che7 system which is required for the proper regulation of a sporulation in *M. xanthus*. Mutations in the system disrupt fatty acid composition of the membranes and result in abnormal production of carotenoids. The Che7 system is also regulated, in an unknown way, by iron availability in the environment. This system appears to display similar architecture to the CrdSA/Che3 signaling pathway and would help to establish a higher order level of systems network control of behavior. Such findings will allow us to renew our current NSF systems biology grant proposal in three years.

Additional ongoing and related projects include:

1) <u>The role of acetylation of the two-component system MisSR during biofilm formation in *Neisseria*</u> (collaboration with . We have generated enough preliminary data to submit a revised proposal to NIH. Due to recent outbreaks of drug resistant *Neisseria gonorrheae*, this are is highly relevant for NIAID.
2) <u>The role of the SrrBA two-component system in Staphylococcus aureus for the control of toxic shock syndrome toxin production</u> (in collaboration with th). We have obtained

pilot funding via the Helen Johnson Scholars Program (CCOM), published a paper in Antimicrobial Agents and Chemotherapy) and submitted two proposals (STTR and R21/R33) to NIH. Due to the highly publicized role of antibiotic resistant S. aureus strains in hospitals, this project is highly relevant for NIAID.

3) The role of xenobiotics affecting the human microbiome (in collaboration with the .b, Psychiatry, Iowa). We have obtained pilot funding (Fraternal Order of Eagles Diabetes Research, CCOM) to assess the mechanism by which antipsychotic drugs lead to weight gain and corresponding diabetes in children. We have identified a significant shift in the microbiome of some patients who took antibiotics (briefly) while also taking risperidone over an extended period (months). We are now testing the hypothesis that xenobiotics synergize to affect the microbiome of mice. That data will be submitted to NIMH and possibly other organizations such as the American Diabetes Association. Due to the recent attention to diabetes and obesity as epidemics in the United States, this work is highly relevant to NIH.

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Service (January 1, 2007 – present)
Since arriving at the University of Iowa in January, 2007, I have participated on many interdisciplinary committees and on many thesis and comprehensive examination committees for students in our programs.

Committees: The University of Iowa

NSF-REU Program, Co-Director	2007
Undergraduate Assessment Committee	2007
Departmental Webpage design	2007 - 2008
Biocatalysis Endowed Chair Search Committee	2007 - 2009
NSF-REU Program, Mentor	2007 - 2010
NIH Iowa Biosciences Advantage, Mentor	2010
Biosciences Admissions Committee (Micro representative)	2009 - 2011
CCOM Department of Biochemistry, Review, Chair	2012
NIH Training Grant in Parasitism, Preceptor	2007 - present
Graduate Admissions Committee, Microbiology	2007 - present
Information Technology Services Faculty Advisory Committee	2007 - present
Desktop Services Review Committee (ITS)	2009 - present
Microbiology Undergraduate Student Association (MUSA) Faculty Advisor	2009 - present
Interdisciplinary Graduate Program in Genetics	2009 - present
Graduate Admissions Committee, Microbiology, Chair	2010 - present
Basic Science Radiation Protection Committee (Micro representative)	2011 - present
Interdisciplinary Graduate Program in Informatics	2013 - present

Thesis Advisor (completed):		degree	current position
	Civil & Environmental Engineering	PhD 2008	
	Microbiology	PhD 2009	CDC, Atlanta
	Microbiology	MS 2009	Yale
	Microbiology	PhD 2011	Forsyth Inst, MA
	Genetics Program	MS 2012	
t	Microbiology	PhD 2012	U Chicago

Thesis Advisor (ongoing):

	Microbiology, CBB program
	Microbiology
	Microbiology

Thesis & Comps Committees (completed)	degree	current position
Bioinformatics	PhD 2007	Agile Genomics
Bioinformatics	PhD 2008	Yale
Bioinformatics	PhD 2009	Max Planck Institute
Microbiology	MS 2009	Vertex Pharma
Microbiology, MSTP	PhD 2011	
Microbiology	PhD 2011	U Michigan
Microbiology	PhD 2013	U North Carolina
Microbiology	PhD 2013	Washington U
Microbiology	PhD 2013	UI, Chicago

Thesis & Comps Committees (ongoing)

	Microbiology, Genetics
	Microbiology
	Microbiology, Genetics
	Microbiology
	Microbiology
	Biochemistry
	Microbiology
	Microbiology

Other Service at Uiowa:

I have participated in a number of activities for the Biosciences program including several oral presentations during recruitment and orientation week each year thus far, conducted interviews, and presented posters during Biosciences recruitment. I act as the faculty advisor for the Microbiology undergraduate student organization. We meet at least once per month to facilitate contact with faculty in Microbiology, provide guidance toward careers in microbiology and carry out fundraisers so that undergraduates can attend the American Society for Microbiology annual meeting each Spring.

International and National Service:

Cold Spring Harbor Laboratory – Advanced Bacterial Genetics (2006 – 2010). I was selected as one of three instructors for a 5 year commitment to teach the "Delbrück Phage Course". This course is taught every June and is composed of 16 students ranging from senior graduate students to postdoctoral fellows to assistant professors and is usually comprised of eight US citizens and eight others from around the world. The intellectual environment is unique and extraordinary. The experiments are designed to teach the power and logic of genetics and expose the students to unique aspects of microbial systems. The course runs for 21 consecutive days and is, in essence, boot camp for bacterial genetics. Total contact hours is approximately 300 for the course. This course has an incredible legacy in microbiology. Being an instructor at CSHL for this particular course both an honor and a great way to represent The University of Iowa among an elite international group of scientists.

American Society for Microbiology, Division J "Cell and Structural Biology" – Chair-elect 2005; Chair 2006; Advisor 2007, Advisor 2008. Areas of research that fall under Division J include flagella and pilus structure, the chemotaxis molecular machinery, the cytoskeleton, cell division apparatus, and higher order cellular structures including biofilms. I chaired symposia in 2006, 2007 and 2008. I attended the ASM Council meeting in Toronto (2007) and presented the arguments to change the name to "Cell and Structural Biology" for our Division and was successful (previously it was known as Ultrastructure and Function).

Reviewer activity. I am on the Editorial Board for *PLOS ONE*. I am a regular reviewer for ASM journals and act as an *ad hoc* reviewer for the following journals:

Applied and Environmental Microbiology
Archives of Microbiology
Biofilms
Bioorganic & Medicinal Chemistry
Biophysical Journal
BMC Genomics
BMC Evolutionary Biology
Current Microbiology
Environmental Microbiology
F1000 Biology
FEMS Microbial Letters
FEMS Microbial Ecology
Genetics
Genome Biology
Journal of Bacteriology
Journal of Molecular Biology
Journal of the Royal Society Interface
mBio
Microbiology
Medical Microbiology and Immunology
Molecular Microbiology
Nature
Nature Chemical Biology
PNAS
PLoS Computational Biology
PLoS Genetics
***PLoS One* (Editorial Board)**
Nucleic Acids Research
Synthetic Biology
Trends in Microbiology

Reviewer for the following Funding Agencies:
BBSRC - Biotechnology and Biological Sciences Research Council (UK)
National Science Foundation
U.S.-Israel Binational Science Foundation
NSF Signal Transduction Panel
NSF Systems Biology Panel