# Teaching Statement – 3rd Yr Review

Since beginning my faculty appointment, I have been strongly encouraged to create an upper level undergraduate class that enhances not only the overall curriculum of the Biology Department, but also allows me to showcase my strengths and use the class as an opportunity to further my research mission. These first two years of teaching have been incredibly rewarding and have allowed me to really interact and engage with undergraduates, as well as think of my own research in broader terms.

BIOL 4120/7120, “When Good Cells Go Bad”, is the new course that I developed. In the Fall of 2010, I offered it only to undergraduates, and then opened it up to graduate students this Fall. The overall goal of the course is to offer our undergraduates something that they have voiced that they feel is desperately lacking in their curriculum, a class that takes the molecular and cellular material they’ve been learning and integrate it into human physiology. That is why I chose to focus my course around neurodegenerative diseases and use specific disorders as the platform to then integrate what students had been learning in Genetics, Cell Biology, etc., with cutting edge research and primary literature. This approach not only excited the pre-medical students in my class because of the disease framework, but also engages those students who are interested in basic science and disease mechanisms. So ultimately, my main goal with this course was to bring together curriculum from other Biology courses and put them into a biological context. My second aim was to introduce many of our majors to research, basic science and primary scientific literature. All too often we think of medicine and basic research as independent endeavors. However, medicine is deeply rooted in findings from basic research, and I wanted our future clinicians and scientists to see that in action. In the course, I give a brief introductory module on development of the nervous system because you can’t discuss nervous system disorders unless you understand how the nervous system is formed. Then we spend the rest of the course discussing 4 distinct nervous system injuries/disorders, including Multiple Sclerosis, Neurofibromatosis, Spinal Cord Injury and a class choice. Each module presents an opportunity to highlight how diverse nervous system disorders are, but also how similar the basic etiology can be between them. We cover what’s known about the cause of the disease, if it’s known, and then focus on primary literature using animal models, etc. to investigate in more depth, the actual cause and progression of the disease. All exams are short answer/essay and approximately 40% of the questions ask students to recall big ideas or facts related to the module, while the remainder of the exam is designed to get students to think about the module, relate it to development or other modules we’ve covered, and design experiments or hypotheses about the current disease. I think students really like these types of questions as they get to think outside of the box, and they’re great for me because it lets me see if they’ve been integrating what we’ve been talking about in class and forming their own ideas. Additionally, within each module, small groups of students present the actual primary literature and in a sense, teach the class themselves. Early in the semester I often have to chime in to keep discussion moving. However, by the last module, I usually have to cut the discussion off so that the students can get to their next class!

I feel very lucky to have been able to design this class as it has helped me think not only about my own research, but also engage our undergraduate population in a way they haven’t been before. Because of the class discussions and general flow of the course, I get to know many of my students outside of the classroom and routinely hear from them even a year later. It’s been an incredible experience for me and I hope to continue to grow in my role as an educator and strive to challenge my students to use all

of their education here at UVa to think outside of the box and really start to engage in science at a professional level before they ever leave Grounds.

In the future, I would like to help teach in a 3000-level Biology course that focuses either on neuroscience or development. An obvious candidate for this would be BIOL 3170, which is currently taught by Drs. Condron and Provencio. I think being a glial biologist would bring an expertise and knowledge to the course that would benefit the students, would enhance the current curriculum and would allow me to interact with our undergraduate majors before they are 4th years, which is how I currently interact with most of them in my own course.

# Teaching Statement – Tenure Package

When I joined the Biology faculty in the Fall of 2009, I was given the fantastic opportunity to create a new, upper level course on a topic that would strengthen my research as well as enhance the Biology undergraduate curriculum. As a trained neuroscientist and developmental biologist, my research has always gravitated towards questions that address how the nervous system is built, and whether the same mechanisms are utilized to rebuild it after disease or injury. After carefully looking at the Biology curriculum and consulting with our Director of Undergraduate Studies at the time, Mike Wormington, Ph.D., I decided to create a course that would tie together many of the basic themes taught in our 3000 level “Core” classes, including Genetics, Cell Biology and Introduction to Neurobiology, to human physiology and disease. The resultant course, “When Good Cells Go Bad” (~50 students), is a full semester curriculum that covers topics related to major nervous system disorders including Medulloblastoma (MB), Multiple Sclerosis (MS) and spinal cord injury (SCI). I emphasize pathology and molecular mechanism of the diseases, current animal research models, possible drug targets and therapeutic discovery approaches. We also spend time dissecting the ethical concerns that surround studying human diseases and the animals used to model them. Generally, I teach the way I was taught, which is driven by questions. At the end of every lecture, I strive to answer the question that I set forth 50 minutes earlier, with both lecturing and student discussion.

Each class period, I have two main goals. The first is that our students realize and understand the intimate relationship that exists between basic biological research and medicine. All too often, the misconception our students have is that medicine and basic research are independent and sometimes competing endeavors. However, medicine is deeply rooted in findings from basic research, and I want our future clinicians and scientists to see that in action. Our “textbook” is current primary literature featuring animal models to study disease progression, etiology and treatment, and students learn to present, interpret and critique primary research articles in class. With this approach to content, I am required to constantly update my materials and present my students with the newest studies and manuscripts. Although sometimes exhausting, this updating not only keeps me intellectually/scientifically engaged in my own field and enthusiastic when teaching, but also imparts a sense of urgency and “buzz” with the students because they know they are learning things that couldn’t possibly be included in more standard teaching materials like textbooks. In fact, I’ve had students tell me they often discuss what they’re learning in my class when they speak with their parents, and by the time they go home for the Thanksgiving holidays, they are often: “put on the spot to answer every family member’s question about a particular human disease.” Although maybe not exactly what they wanted to talk about over dinner, I tell my students that they need to be educated and thoughtful representatives for science and medicine. Even though many of them will not become clinicians or scientists, their degree in Biology serves as a

platform that allows them to inform non-biologists on a variety of health-related topics and it is their responsibility to give educated opinions, no matter the topic.

My second goal is that our students start thinking like professional scientists before they leave Grounds. The majority of Biology courses our students have taken before they get to my class require them to absorb a significant amount of information about biological processes and synthesize it into models and basic biological theories. What they do not get much of, however, is the opportunity to carefully scrutinize that knowledge base and learn to define where there are holes and how to scientifically approach filling them. In my course, using human diseases/injury as a context, I help my students learn to identify the edge of a specific field and then push them to think outside of the box and design experiments that are scientifically sound and a next plausible step in understanding human diseases and therapeutic possibilities. To gauge their ability to synthesize information and extend it to into a novel direction, my exams consist of short essay questions designed to get them to think about the module, relate it to development or other modules we’ve covered, and design experiments or hypotheses about the current disease. I have found that initially, most of my students are very uncomfortable being pushed past their boundaries and delving into subject matter that doesn’t end with a “right answer.” However, by the end of the semester, the students overwhelmingly enjoy their new found “freedom” when thinking about science and leave UVa better equipped to be thoughtful, engaged doctors and scientists.

I feel very lucky to have been able to design this class as it has helped me think not only about my own research and grow as a mentor and teacher, but also engage our undergraduate population in a way they haven’t been before. Because of the class discussions and general flow of the course, I get to know many of my students outside of the classroom and routinely hear from them years later. It’s been an incredible experience for me and I hope to continue to mature in my role as an educator and strive to challenge my students to use all of their education here at UVa to think outside of the box and really start to engage in science at a professional level before they ever leave Grounds.

In the future, I am eager to develop an introductory 3000-level Developmental Biology course: From Cells to Organisms. I am passionate about teaching and am excited about the opportunity to reach more undergraduates (150-200) and infect them with my enthusiasm for science. This course would serve not only our students, but also allow many of our upper level classes to delve deeper into topics knowing that the students have been exposed to basic developmental biology concepts and paradigms.