Teaching Statement– Seth Sullivant

My teaching philosophy is that classes at all levels should engage students. For me, this means getting the students to think about how the topics in the class relate to advanced research projects, or how they might use the techniques they learn to address problems in statistics, mathematics, and their applications. I am a strong believer in the importance of research projects for students in classes at the advanced undergraduate and beginning graduate level. Too often, graduate students get all the way through their oral exams without any real experience working actively on producing original research work. The resulting gulf that is created between the students and research can be unnecessarily intimidating for many students. One of my goals as a teacher at the advanced level is to get students interested in working on open-ended problems.

At a more elementary level, I believe that it is essential that if undergraduate students are to succeed in their chosen fields, they need a firm grounding in basic mathematics and statistics. This means ensuring that the basic material is covered at a suitable level. These types of introductory classes represent a great opportunity to get students to appreciate the importance of not only rigorous reasoning, but also the crucial role that creativity has to play in scientific research. Furthermore, statistics and mathematics are vitally important for research throughout the sciences, though elementary courses are often taught with very little mention of these connections. I see the teaching of these courses as an opportunity to highlight for the students the important role that mathematics and statistics play in the sciences.

Due to my continuing research funding, my recent teaching experiences have been limited to teaching advanced short courses in algebraic statistics (at Harvard; Nordfjordeid, Norway; the University of Buenos Aires; Technische Universiteit Eindhoven; and College Station Texas). Earlier, I was a teaching assistant for calculus courses at UC Berkeley and a lecturer for courses in algebra and precalculus at San Francisco State University. The courses at SFSU, in particular, have greatly influenced my feelings about the importance of developing a presentation style that engages the audience and also the importance of judging the level of the audience. As an expert in one's field, it is easy to forget that it can be difficult to learn new material and that it is often necessary to have many different approaches to explain a concept. Teaching these courses has proven useful for me in teaching and lecturing at all levels, because it has brought my focus away from merely describing a result, and towards the process of thinking of new ways to explain a topic and the possible difficulties that might arise for an audience learning a new subject.

I am interested in teaching a range of classes in statistics, probability, and algebra. As my research interests span a range of topics in these areas, it will be important for me to teach advanced courses in statistics and algebra as a way to get a diverse group of students involved in teaching. Particular advanced topics courses I would be interested in teaching include graphical models, discrete multivariate analysis, combinatorial commutative algebra, and computational algebra. I am also interested in teaching an advanced course on algebraic statistics, as a way to introduce students to my current research. I plan to base this course on material I have used in previous summer schools, together with new material for an Oberwolfach seminar on algebraic statistics (jointly taught with Mathias Drton and Bernd Sturmfels), to be given in 2008. We plan to turn the lecture notes for the Oberwolfach seminar into a book, which we hope will become a standard reference for introductory courses on algebraic statistics.

I am also interested in teaching advanced undergraduate classes which can serve the purpose of introducing students to active research areas. For example, a course on computational algebra is generally easy to get undergraduate students involved in, because it is concerned with familiar objects like polynomials and prime numbers. However, it immediately leads to a range of advanced topics and can be the springboard for students to begin pursuing research in algebraic geometry, commutative algebra, combinatorics, optimization and a range of other topics. Similarly, an undergraduate course on mathematical methods in biology leads to a broad spectrum of advanced topics, including polyhedral geometry and combinatorics, Markov processes, graphical models, and other notions from statistical modeling.