Personal Statement by Kamal Kevin Barley

Mathematics is my main academic interest and although I have, at various times, taken an active interest in other disciplines such as physics and computer science, these forays always proved transitory. The perpetual fascination that mathematics has for me probably stems as much from the vastness of the subject as from its powerful applications to almost all areas of human activity. I have found that mathematics actually complements diverse fields in the fine arts, such as canvas painting and sculpture. Indeed, artistic expression seems to become more exciting and more challenging when certain geometrical principles, such as *depth perception*, *perspective,* and *ideas of curvature* are subtly woven into the actual expression of the artist's vision of the work being created. The advent of the computer and digital technology is making the close connection between the fine arts and mathematics evermore apparent. This is particularly true in music as well as in graphic design and animation. Similarly, the applications of mathematics to *every day problems* in the sciences and engineering are a constant source of amazement to me. For example, the derivation of the equation of the suspended cable (that is, the derivation of the catenary curve) has simplicity and precision that can only be called *beautiful* in the same sense that a musical masterpiece can be termed beautiful.

For my own part, I feel a deep sense of honor to be actively involved in mathematics, and I expect this involvement to continue since I plan to become a mathematics professor. In this connection, I wrote several research papers on differential geometry, the most recent one of which is titled *Schwarz's Lacunal Surfaces*: *A Special Class of Minimal Surfaces*. This study examines the representation of minimal surfaces in terms of (real) Jacobi elliptic functions and is, along with the other two (2) papers. My second research paper in mathematics, *Parallel Transport and Curvature in Differential Geometry and Theoretical Physics,* was a challenging project that was done during the 2003 Science- Mathematics Summer Research Institute at SUNY – Stony Brook (AGEP).

During most of my junior year I was involved in research on *Viviani's Problem*, an old and interesting problem in geometry that can be investigated using the mathematical tools commonly available to college juniors. This investigation offered me an opportunity to review many important topics from mathematics and, at the same time, gave me a broader idea of what it means to " solve a geometry problem," in the sense of scholarly research. Fortunately, this

problem offered many opportunities for me to use my knowledge of computers to advance my understanding of mathematics. I am very fond of my paper on Viviani's Problem, because – although the topic and the (mathematical) methods used were classical – it constitutes my initiation into the world of research mathematics.

In the Fall of 2005 I was fortunate to have Dr. Carlos Castillo-Chavez as my mentor. He and his research group showed a different are of mathematics that I found very interesting. As consequence, I have shifted my interest to Mathematical Biology and I plan to make Mathematical Biology my main interest. An important lesson I learned in MTBI (Theoretical and Mathematical Biology Institute) for which Dr. Castillo-Chavez is director, is that to be a good applied mathematician one needs to have a really good background in pure mathematics. For this reason I have been focusing in understanding as much as possible areas of pure mathematics such as analysis, theory of ordinary and partial differential equations.

When I complete my graduate studies, I would like to become involved for two or three years in post-doctoral work in mathematics at a leading research university to see first-hand how new ideas in mathematics originate and how established ideas are reformulated so as to advance the discipline. Once the post-doctorial work has been completed, I would like to join the faculty of a college or university that has a strong undergraduate research program in mathematics. My teaching duties will be as important as my duties as a research mentor, even though I am well aware of the fact that most of the students in my classes (particularly in courses such as pre-calculus and finite mathematics) will probably not share my passion for and devotion to mathematics.