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## Beckman Scholar 2005-06

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### **Selection Process**

At the beginning of my sophomore year, I had finished writing about my research for my first principal-authored publication. At that time, Dr. Cooper informed me of the possibility of applying as a Beckman Scholar. The selection process mainly consisted of an extensive project proposal, a personal statement, a résumé, and letters of recommendation. The application having separated me enough from other candidates, I was not required to go through the interview process given to most candidates. The Beckman selection committee at the University already knew me from courses and personal interaction, so maybe I was really being interviewed throughout the year without even knowing it.

### **Research experience**

I have worked in Dr. Cooper's lab for three years. Since my first month at UK, Dr. Cooper has shown me work ethics, strong dedication, and involvement in the community. This time spent in the lab has resulted in 27 presentations and 8 publications. My mentor has the ability to expose and accentuate the best in all the students he encounters. As required of any UK Beckman Scholar, I work in the lab at least 10 hours per week during the year, and 20 hours per week during the summer. Those hours are, however, often extended to allow further testing and to perform demanding experiments.

Working in Dr. Cooper's lab has certain characteristics that differentiate it from other research lab experiences I have had. Contrary to a vast number of college professors, Dr. Cooper spends a large portion of his time following the advances of the projects done by undergraduates. It has been common for me to spend hours in his office discussing the best way to answer

a certain scientific problem, e.g., "How can I demonstrate whether the fly's central nervous system is involved in the response of the animal to a given substance?" The lab atmosphere is also very positive because every student (doctoral, masters, and undergraduates) is aware of each other's projects and makes time to help each other. Finally, being part of a lab as productive as Dr. Cooper's (11 peer-reviewed publications while I was a Beckman Scholar) has an extremely invigorating effect on the students who are already excited about research.

### **Extra Activities**

The Beckman Scholarship has given me much more than the opportunity to perform and present my research. This award has allowed me to be recognized as an undergraduate leader in the area of research throughout the University. This status has encouraged me to use available resources to promote more undergraduate research. As such, I co-founded the Society for the Promotion of Undergraduate Research (SPUR). This organization now includes more than 150 undergraduate student researchers and others interested in research. As an organization, we discuss current research performed by our fellow students, we offer help to find mentors and to deal with common problems, and we try to encourage even more involvement of students in research.

Because SPUR was such a success, I decided to contact the administration about creating an event that would showcase the research performed by undergraduates at the University of Kentucky. The event would publish an abstract of each project, would be entirely run by students, and would be friendly to a general audience. As a Beckman Scholar, I caught the direct attention of Dr. Philipp Kraemer, the Associate Provost for Undergraduate Education, who approved the funding for the project. As a result, the "Showcase of Undergraduate Scholars" became the largest academic event for undergraduate research at the university, presenting the work of more than 120 students.

My outreach activities have not all been done at the University. Growing up in France, I remember having the chance to attend some of the best and most demanding schools for my primary education. I vividly remember our teachers bringing guest speakers from universities to discuss complex concepts with us. This memory was decisive in my choice to become involved with middle and high school education in Kentucky. Dr. Cooper is always involved in outreach and offered me the opportunity to participate in a class he offers to teachers as part of their continuing education programs. The class was run by the Fayette County Public School and partially

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funded by the NSF. It enables middle and high school teachers to be updated on the latest research and find novel ways of teaching using lab equipment. As part of the teaching staff, I helped teachers understand some of the biological models, and I also took the initiative to teach one day when Dr. Cooper had to be absent. My presentation, entitled 13 tests to explain biology through *Drosophila*, was so appreciated that I was asked to be a teaching assistant the next time they had the class.

Now that I know many of the science teachers in Fayette county, I have started going to middle schools and high schools. When I go to schools, I particularly enjoy assisting students on science fair projects, for which I often serve as judge at the local and the regional level. I also often visit schools as a guest speaker, discussing my research and research in general. Going to schools has allowed me to assess the practicality of our teaching, thus allowing me insight into what to improve.

Another project I have pursued outside the University has been *Impulse*. This peer-reviewed journal, completely directed and reviewed by undergraduates, has been a most rewarding experience. I have been a reviewer for the journal for the past two years, and being able to help other undergraduates from around the world in their research is fascinating.

### Benefits From Beckman

I do not believe that half of the projects, I have been part of would have been possible without the Beckman Scholarship. Receiving this award has allowed me to be financially independent, thus not having to have part-time jobs during the year and full-time jobs in the summer. Further, my success as a Beckman Scholar has permitted me to inspire students of all ages to participate in research.

### Future Plans

I am not graduating until 2007; therefore, I plan on continuing all my activities for another year. There will certainly be plenty of lab work involved, but also some teaching, because I am a teaching assistant for two classes. My research will be more diverse because I will be working in three different labs in three different departments. I will continue going to schools in the community. I have recently planned a trip to an elementary school. The Showcase of Scholars will certainly be an important event this year and everyone is projecting another large attendance. SPUR will have the crucial task of finding new young talent to replace those of us who founded it and are about to graduate. *Impulse* has passed this problem and will certainly become a more and more well known journal as years go by.

As far as my career goals, I am still uncertain. I have a strong passion for people and research, thus, academic medicine may fit my personality. On the other hand, my eagerness to have a large impact pushes me toward public health. In that field, I would like to influence policy makers concerning the importance they place on research, and on the necessity to be aware of the latest research when creating guidelines or laws. I am currently applying to MD/PhD and MD/MPH programs around the country including at the University of California, San Francisco and Johns Hopkins.

### Current Research

The following is the introduction to the latest research article that Dr. Cooper and I are submitting:

The normal function of ion channels, such as  $Ca^{2+}$  channels, within a given tissue can range from being essential for cell survival to only slight disturbances in function, depending on the cell's requirements. A variety of pathological conditions exist in humans, due to altered ion channel function in various tissues (Flink et al., 2003). Many of the known diseases related to ion channel function are due to mutational effects (Flink et al., 2003). Some of these pathologies are not severe enough to be lethal in embryological development but allow survival to some period, albeit with a decreased quality of life. The use of genetic mutations in animal models allows one to investigate the broad actions of such mutations in various bodily systems over acute and chronic periods, depending on the severity of the mutation and the functional needs of the animal.

The cacophony gene (*cac*) in *Drosophila* codes for the  $\alpha 1$  subunit of a voltage-gated calcium channel. The  $\alpha 1$  subunit produces the pore of the voltage-gated ion channel. With the use of a transgene to express green fluorescent protein (GFP) with a *cac*-encoded  $\alpha 1$  subunit it has been demonstrated that motor nerve terminals in *Drosophila* express  $Ca^{2+}$  channels (Kawasaki et al., 2004). A mutation in this segment, has also been characterized in a temperature sensitive line (*cacTS2*) in which, the  $Ca^{2+}$  appear to have reduced flux when the temperature is raised, due to a conformational alteration in the channel. Synaptic transmission is reduced at the neuromuscular junction (Xing et al., 2004). *CacTS2* adults exposed to 38°C for 3 minutes stop flying and walking, which implies that the alterations measured electro-physiologically in the skeletal muscles of larvae also apply to motor units in the skeletal muscles of adults (Kawasaki et al., 2004) and, possibly, depresses other sites of synaptic communication centrally.