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The Importance of Research in Undergraduate Education: The Impact of the Beckman Scholars Program

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I should start by describing a bit of my philosophy concerning undergraduate education. I am a firm believer in undergraduate research as part of a student's formation in any scientific discipline. While coursework allows students to gain theoretical knowledge in their discipline of choice, it is essential that they realize how what they learn in class relates to day-to-day life and to the advancement in science. This connection can only be made if the students have hands-on experience in a laboratory setting that stimulates their imagination and enhances their critical thinking process. In the UK Department of Chemistry, we have several mechanisms by which students can be exposed to research and gain the needed experience. Students can perform research by enrolling in CHE 395. The course can be taken for up to nine credit hours and the student chooses an advisor from among



all the faculty members of the Department of Chemistry. Often, the students continue being an active member of the chosen research group even after completing their CHE 395 requirement. For students who are considering a research career or a medical profession, this is an

invaluable experience.

In addition to CHE 395, over the last ten years, our Department as well as the Center for Membrane Sciences has been sponsoring with funding from the National Science Foundation (NSF), a "Research For Undergraduates" (REU) Program. These REU Programs typically run over eight weeks during the summer months, and in some cases have activities that continue throughout the next academic year. Given my interest in undergraduate research, I served as the Director of the NSF Program of our Department during a number of years. As part of the two-month summer program, the student participants are involved in research projects in the laboratories of the REU faculty. These projects are selected carefully to be within the abilities of the students, but at the same time to be challenging and to promote interactions among the participants, the faculty, and the graduate and postdoctoral student members in each REU advisor's research group.

Through the preparation of an interim report at the beginning of July and a final research report at the end of the summer, the students experience how scientists organize and present their data. All students participate in an "in-house" Research Conference at the end of the summer at which they give poster presentations of their research. A series of talks are organized during the summer to introduce the students to various aspects of a research career. The topics range from scientific ones to career-oriented ones, so the students are exposed to the different aspects of the life that they will encounter if they choose to pursue higher education. Often, students who live within driving distance of our University continue their research during the academic year.

As part of this program, REU students attend and present papers at scientific meetings. In 2003, our REU students once again received competitive awards at these meetings for their REU research, continuing our 16-year-long tradition of students receiving competitive awards for their work. A large number of manuscripts have resulted from work performed by these undergraduate students. There is no doubt in my mind that opportunities such as REU program pre-



pare undergraduate students better for their future careers in research.

Another mechanism by which talented undergraduate students can receive support to pursue research within a specific laboratory at the University of Kentucky is through the Beckman Scholars Program. This is an extremely competitive program that awards two scholarships a year. I have had the pleasure to be involved with the Beckman Scholars Program from the beginning, and one of my students, Anna Rothert, has been the recipient of a 2003 Beckman Scholarship. Anna first began working in my laboratory as a technician during her sophomore year at UK. Realizing that she was a hard-worker with great scientific aptitude, Dr. Sapna Deo, an Assistant Research Professor in our Department and I encouraged her to perform research within our group. Anna eagerly accepted, and soon began working on her own project mentored by Dr. Deo. In the two and a half years that Anna has been a member of my group, she has shown a level of maturity and understanding that is uncommon in undergraduate students. She demonstrated her dedication to research by always finding time for research in the midst of a full schedule of classes, which usually included several at the graduate level. Anna is extremely intelligent and managed to maintain a perfect GPA through her undergraduate career. Needless to say, Anna is not only a very independent and capable researcher, but also highly productive. In that regard, she is already the co-author of several research presentations and publications. Anna is able to manage different projects at the same time, and is currently serving as mentor of other undergraduate students. On a personal note, Anna is one of the most delightful and kind individuals who has passed through our laboratory. She is always willing to help, listen to advice, and is prompt to tackle new challenges without hesitation. Everyone in the Daunert group loves Anna! Anna has chosen to pursue a Ph.D. in Biochemical Nutrition at the University of Wisconsin and is scheduled to start in the Fall of 2004. I am certain that she will be a star student there, and let me assure you that we all are going to miss her!

In reflecting on how the Beckman Scholars Program influences the career of a student, I think that we should also consider what kind of an impact the Program has on the research group that hosts the Scholar. There is no doubt that such an award helps propel the career of a student by allowing him or her to focus on research without the need for the student to worry about finances, as the scholarship funds are quite generous. Moreover, because it covers a full

year of research, and sponsors a trip to a conference of choice, even overseas, “allows the students to perform meaningful projects that result in research that can be presented in scientific meetings and/or in publications. The Beckman Scholars Program is also beneficial to the laboratory that hosts the student because it is always important to have students who are talented and can serve as role models for the incoming junior ones.

As I mentioned earlier, I think that it is very important to support and encourage undergraduates that want to be involved in research activities. My laboratory typically has about five or six undergraduates working in our group over the course of a year. These students each have their own independent research projects and are given direct guidance by graduate students, post-doctoral students, Dr. Deo, and myself. Through the years, many of the undergraduate students who have worked within our group have received prestigious fellowships and awards for their research. These students are typically very successful once they graduate and go on to pursue graduate studies in Chemistry, Chemical and Materials Engineering, Pharmaceutical Sciences, or attend Medical School. In our research group, the senior undergraduate, graduate, and postdoctoral students have a sense of pride when one of “them” is recognized for their work or achieves such an honor as to become a Beckman Scholar. In my view, having the research of a laboratory recognized by an award to a student is as important or more so than when the honored individual is the head of the research group. It is an incredible motivator for the students as well as for the research advisor, and stimulates the desire to reach for the “stars” in all of us.