

## S.M.A.R.T. (Science, Mathematics And Research Training) program for underrepresented K-12 students at Woodlawn High School

In addition to advancing technology, modern science must be devoted to the establishment of a cultural knowledge, which aside from generating new understandings, works to communicate these findings to the public at large. Natural barriers to the dissemination of knowledge are presented by preexisting cultural divisions; this fact is well known to science educators, where issues of gender and ethnic asymmetries are well studied [46]. Symptomatically, physics and mathematics stand out in the sciences for having the lowest representation of women and underrepresented minorities (URMs); one of the key reasons is the inefficacy of science education in high schools that serve URMs. More broadly, public outreach programs from the sciences are seldom positioned to exploit existing ties with local URM communities.

*The University of Chicago is uniquely situated for outreach programs targeted toward underrepresented minorities, due to its location in Hyde Park on the historic south side of Chicago, where over 90% of the local high school population is of African American heritage. Further, the community is an enthusiastic partner in science outreach in particular, as demonstrated by the success of the University of Chicago's Enrico Fermi Institute's Compton Lecture Series, a three-decade tradition of public lectures well-attended by members of the Hyde Park community (a postdoctoral researcher in my group, Nathan Gemelke, will provide a series of ten of these talks in the near future.)*

This opportunity has been well recognized by University of Chicago administrators, who recently initiated a major project to extend the university's education capacity to primary and secondary schools in nearby neighborhoods. In particular, the university is building an innovative high school in the Woodlawn community-- where the population is >98% African American and Hispanic. This high school, an expansion of the University of Chicago Charter School system, was commenced in the fall of 2006 and will reach its full capacity in 2010.

Due to the fortuitous timing, I find the newly created Woodland High School (WHS) an excellent opportunity to contribute critically to high school science education in a welcoming and enthusiastic URM community. I propose to launch a 'SMART' program to strengthen the WHS science and mathematics curricula and to motivate greater interest in physics and mathematics. I propose

as extensions to the university's existing commitment, and with support from this CAREER proposal, the following three initiatives

### 1. Strategic Partnership with Woodlawn High School Educators

In coordination with Dr. Timothy Knowles, Executive Director of the Center for Urban School Improvement and the Office of Academic and Social Supports of the Woodlawn High School, the science faculty and I will explore sensible collaborative avenues to align curricula with demands of modern technology and relevant scientific fronts. The goal is to enhance science education and better inspire and prepare high school students for a four-year college education in science and mathematics, and lifetime science or technical careers.

### 2. SMART tours and projects at the University of Chicago

Early exposure to a research environment and attitudes can challenge the conventional impression of science as a "dull and difficult-to-swallow" subject. We will provide SMART tours for high school students to visit the university and to realize the excitements of new discoveries. For highly motivated and interested students, we will provide "SMART" project positions at the university. Both tours and projects take full advantage of University sponsorship and echo the education goals of Woodlawn high school to explore new and innovative extracurricular exposures.

### 3. Web-based SMART links to high school students and teachers

To maintain the partnership with educators and students in Woodlawn High school, we will develop novel web-based communication tools to share knowledge and resources on science education (for example, we will work with the science teachers to identify and collect appropriate science demonstration videos), answer science and mathematics questions, schedule "vis-à-vis science chats" and announce on-going and future outreach activities. This project is synergetic with the Woodlawn High education plan to provide a laptop computer for every student (1:1 Laptop initiative and Digital Youth initiative) and a wireless (Wi-Fi) environment on campus.

## **Resources**

### 1. Chicago MRSEC (Materials Research Science and Engineering Center)

Chicago MRSEC actively pursue several outreach programs from the grade school level on up with a special emphasis on attracting women and URMs in science. The outreach program manager, Eileen Sheu, is experienced

and keen in developing educational programs to improve science literacy for pre-college students. I will work closely with her on the SMART program.

2. University of Chicago Center for Urban School Improvement (USI)

Initiated by the University of Chicago, the mission of the Center for USI is to improve K-12 education in the Chicago area. The Woodlawn High school is one of the three campuses the Center oversees. The SMART program will be initiated in close collaboration with the Center Director Dr. Timothy Knowles, who has expressed strong support for the collaboration. *A collaboration letter is included in this proposal.*

3. Ms. Zosia Krusberg, Dr. Nathan Gemelke and Dr. Kathy-Anne Brickman

With a physics education degree from Harvard, Zosia Krusberg is now a Ph.D. student in our department. She is also the organizer/speaker of the 2008 "Space Explorer" K-12 outreach program, supported by the Office of Special Programs at the University.

Dr. Nathan Gemelke and Dr. Kathy-Anne Brickman are post-doctoral fellows in my group. Both of them have extensive experience in teaching and guiding undergraduate students. Nathan Gemelke, in particular, is also the speaker of the 66<sup>th</sup> Compton lecture series, which make accessible some of the remarkable recent developments in physical science to the non-specialized public in Chicago area.

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