

APPENDIX 15: UNIVERSITY OF PENNSYLVANIA/NSEC PROFILE

I. Description

Institution: University of Pennsylvania

PI: Dawn Bonnell

Co-PI's: Yale Goldman

Title: Molecular Function at the Nano/Bio Interface

Proposal: 0425780

Program Officer: Ulrich Strom

Education Outreach Director: James McGonigle, jmcgon@seas.upenn.edu

II. Research Agenda

Research Focus: Two multi disciplinary research teams are focused on aspects of the fundamental issues. Two cross cutting initiatives develop ideas integral to each and make explicit links between them. The two fundamental themes are: (1) optoelectronic function in synthetic biomolecules and (2) mechanical motion of molecules from physiological systems. In each area physical interfaces probe, control, or influence the outcome. Each theme has a strong fundamental component and obvious technological impact that ranges from nanoelectronics to medical diagnostic devices. Intersecting each theme is an initiative on development of new probes of molecular/nanostructural behavior. In addition, an overarching activity concerns the ethical implications of nanotechnology specific to the research themes and in a broader sense.

NSEC Description: The center's research is aimed at the interface of nanotechnology and biology at the molecular level. Potential practical outcomes are in the areas of nanoscale device manufacturing, drug delivery and integrated chemical sensors as well as understanding basic complex biological and physiological processes. The center will impact public education, social discourse, workforce development, and diversity, both locally and nationally, and will examine ethical issues in nanoscience and technology.

III. Education Activities within the University

One of the important outcomes the NSEC in terms of human resources will be a population of undergraduate and graduate students as well as post docs with high quality training in nanotechnology as it relates to the important issues at the nano/bio interface. In order to properly prepare students to take leadership roles in these areas, new curricula are required for which academic disciplines do not exist. The students supported in this NSEC will have access to two new curriculum initiatives in nanotechnology that are administered by the center.

The goal of the education activities within the University is to increase the involvement of students in the field of nanoscale science. The NBIC supports a number of programs aimed at undergraduate and graduate students. Undergrads are supported in summer research positions in various labs along with the ability to apply a minor in nanotechnology to their degree. Graduate students can add a certificate in nanotechnology to their transcripts

Workshops and Seminars. The NBIC will support various workshops and seminars. This year, the Center supported the Chemical Biophysics Mini-Symposium on Single Molecule Approaches held on 21 April 2005.

IV. Education Activities outside the University

The goal of education programs designed to extend beyond the University is to reach as wide an audience as possible with programs and activities that introduce nanoscale science and its growing impact across society. Programs are aimed at high school science and math teachers, pre-college students, and the general public.

Program staff: James McGonigle is the Programs Coordinator for the NBIC for programs within and outside the University. He has a MS in Biology and a BS Ed. in Biology and General Sciences. Since 1987, he has worked as an education director in various museums and research laboratories where programs were focused on teacher professional development. Prior to that, he taught high school biology and environmental science.

NanoDay @ Penn is an open-house type event featuring exhibits, demonstrations, a poster session, and various talks and seminars. Most of the attendance is made up of University students. This year NanoDay is inviting local high schools to tour its labs and participate in the day's events. Scheduled for 26 October 2005.

RET-NANO is a 5-week Research Experience for Teachers run in collaboration with the Drexel University Nanotechnology Institute. This summer, 18 teachers from the Philadelphia School District and surrounding region participated. The 2005 program ran from 11 July - 12 August.

Professional Development Workshops are developed and presented to individual school faculties or other specialized groups. This year, the NBIC provided workshops for science and math faculty at the Marianna Bracetti Charter School in North Philadelphia along with a workshop for high school principals from the Bronx, New York in collaboration with Penn's Graduate School of Education.

High school students from across the country participated in a 3-week nanotechnology summer academy on the Penn campus. Two graduate students from the NBIC acted as the primary program staff and instructors. Participants toured the microfabrication lab and nanotechnology characterization facility and conducted numerous laboratory activities.

V. Education Outreach Materials

The NanoDay @ Penn program scheduled for 26 October will be our first opportunity to develop a variety of exhibits or demonstration to explain and interpret nanoscale science in outreach programs.

VI. Education Outreach Evaluation

We have adopted the pre and post survey tool developed for RET programs across the country. We will use these evaluation data locally to further develop the program and plan to submit data to the researchers at Notre Dame University for the national study of RET programs.

VII. Lessons Learned

It is important to communicate with teachers early and well in advance of their participation in programs like an RET. Next year, we will prepare a more specific “nanotech primer” that teachers will be required to complete prior to arrival to the program. This way, everyone will have an opportunity to develop a basic understanding to nanoscale science and perhaps be better prepared to integrate into the research group with whom they will work over the ensuing 5-week period.

