

# The Northeastern University Young Scholars Program



**The Young Scholars Program at Northeastern University** began in 1989 in response to a national shortage of qualified U.S. citizens moving into STEM careers. Resurrected in 2005 through support from The **Noyce Foundation**, the NU Young Scholars Program (**NUYSP**) addresses a critical recommendation made in the recent national report, "Rising Above The Gathering Storm", by providing expanded experiential learning experiences in STEM for K–12 students. The model developed at NU has been refined over the past 17 years to become a comprehensive learning experience for program participants and staff. **NUYSP** offers future scientists and engineers a unique opportunity for hands-on experience while still in high school. It also provides faculty and graduate students the opportunity to mentor our next generation of STEM professionals. The program is open to Greater Boston area applicants who have completed their sophomore or junior year in high school. In order to allow students from all income levels the opportunity to partake in this experience, all participants earn a weekly stipend.

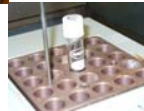
**Laboratory Research Experiences** Students are assigned to laboratories in teams. Participating faculty are recruited from the Colleges of Engineering and Arts & Science along with affiliated research centers, **CenSSIS** (The Center for Subsurface Sensing and Imaging Systems), and the newly established IGERT (Integrative Graduate Education and Research Traineeship) Program, part of the Center for Nanomedicine Science and Technology at Northeastern University

**YSP Alumni** The Noyce-sponsored NUYSP has had 58 student participants to date. Thirty of the fifty-eight have graduated high school with the rest expected to graduate in 2007 and 2008. Of those whom have graduated already, all but one chose to major in a STEM-related field including Chemistry, Biology, Engineering, and Physics at prestigious universities across the country. Young Scholars alumni are currently attending Boston College, Boston University, CalTech, Carnegie Mellon, Case Western, Cornell, Dartmouth, Harvard, Lehigh, McGill, Massachusetts Institute of Technology (MIT), Northeastern, Rensselaer Polytechnic Institute (RPI), Worcester Polytechnic Institute (WPI), and Yale.

## Sample Assignment



**ORP and COD Tests**



*COD Goal: To measure the amount of oxygen consumed*



*Oxidation Reduction Potential*



**Clean Up of Contaminated Soils by Electrokinetic Techniques** In-situ aerobic bioremediation processes are attractive, efficient and cost-effective methods that can be used widely for the clean up of contaminated groundwater systems. Successful implementation of in situ bioremediation is dependent upon the effective supply of electron donors/acceptors and nutrients into the porous medium. Microbial processes require an electron donor, macronutrients (e.g., nitrogen and phosphates), micronutrients, trace nutrients, and an electron acceptor. The availability of dissolved oxygen as electron acceptor, however, is considered one of the essential variables governing intrinsic aerobic biodegradation rate in soil and groundwater. Long-term addition of oxygen to subsurface systems presents an engineering problem because of the limited solubility of oxygen in water, the heterogeneity of soil, the preferential flow paths, and the limited hydraulic conductivity of fine-grained soils (e.g. less than 10-4 cm/sec). A possible method for increasing dissolved oxygen levels at contaminated sites is by electrolysis. This research investigates the potential applications of direct current in enhancing in-situ aerobic biodegradation of contaminants. Direct current of few Amp/m<sup>2</sup> is used to generate and inject dissolved oxygen into a low permeability soil by electro-osmosis. Once oxygen is generated at the anode, its progress throughout soil will be monitored. The microbial activity in the soil will be assessed and correlated to the travel rate of oxygen through the soil.

This study involves using different measurement techniques, including Gas Chromatography (GC), Ion Chromatography (IC), Total Organic Carbon (TOC) analysis, Chemical Oxygen Demand (COD) analysis, and others. Biological activity assessment will involve bacterial culturing and maintenance techniques, microcosm studies and growth rate determination. The participant is expected to work jointly with graduate students in the laboratory. He/she will need to ultimately develop an understanding in electrochemistry and microbial activities. The participant is expected to develop the skills of preparing environmental samples for analyses.

*The program seeks to maintain a balance between academic and social components, providing students an opportunity to build relationships with university students and faculty in addition to fellow participants. Our objective is to create and support a STEM community well beyond the six-week summer experience.*



**Jacquelyn Booth**  
Andover High School  
Research Assignment:  
[Progressive Collapse of Reinforced Concrete Structures](#)  
Research Mentor:  
Mehrdad Sasani  
Civil and Environmental Engineering



**Elizabeth Lawler**  
Notre Dame Academy  
Research Assignment:  
[Nanotechnology for Medical Diagnosis and Therapy](#)  
Research Mentor:  
Mansoor Amiji  
Pharmaceutical Sciences



**Omid Salehi**  
Westwood High School  
Research Assignment:  
[Tissue Phantoms for Biomedical Imaging](#)  
Research Mentor:  
Charles DiMarzio  
Electrical and Computer Engineering



**Lili Ge**  
Boston Latin School  
Research Assignment:  
[Nanotechnology for Medical Diagnosis and Therapy](#)  
Research Mentor:  
Mansoor Amiji  
Pharmaceutical Sciences



**Michael Lin**  
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Research Assignment:  
[Flame Speed Measurement using Constant Volume Vessel](#)  
Research Mentor:  
Mohamad "Hameed" Metghalchi  
Mechanical and Industrial Engineering



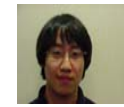
**Tracy Spataro**  
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Research Assignment:  
[Tissue Phantoms for Biomedical Imaging](#)  
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**Tucker Howard**  
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Research Assignment:  
[Microwave Magnetic Materials and Integrated Circuits](#)  
Research Mentor:  
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**Ashley Manolakis**  
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Research Assignment:  
[Clean up of contaminated soils by electrokinetic techniques](#)  
Research Mentor:  
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**Langston Sun**  
Sharon High School  
Research Assignment:  
[Effects of nutrient deprivation on the action of insect insulin-like hormones](#)  
Research Mentor:  
Wendy Smith  
Biology



**Christina Kam**  
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Research Assignment:  
[Advanced Technologies for Mutual Adaptive Affective Human Machine Systems](#)  
Research Mentor:  
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**Lauren McGoough**  
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[Advanced Technologies for Mutual Adaptive Affective Human Machine Systems](#)  
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Mechanical Engineering



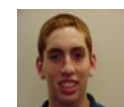
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[Microwave Magnetic Materials and Integrated Circuits](#)  
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Electrical and Computer Engineering



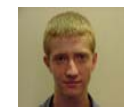
**Dan Kramer**  
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[Progressive Collapse of Reinforced Concrete Structures](#)  
Research Mentor:  
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[Clean up of contaminated soils by electrokinetic techniques](#)  
Research Mentor:  
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Civil and Environmental Engineering



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Research Assignment:  
[Effects of Defects on the Mechanical and Dynamic Response of Diffusion Bonded Structures](#)  
Research Mentor:  
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Mechanical and Industrial Engineering



**Dmitriy Kozlov**  
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Research Assignment:  
[Tissue Phantoms for Biomedical Imaging Using Entrapped Air](#)  
Research Mentor:  
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Electrical and Computer Engineering



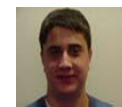
**Linda Nguyen**  
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[Liquafaction Mitigation Using Entrapped Air](#)  
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[Effects of nutrient deprivation on the action of insect insulin-like hormones](#)  
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