The NYU Materials Research Science and Engineering Center (MRSEC), supported by the National Science Foundation (NSF), operates a multi-faceted Education & Human Resources program that encompasses the K-12 sector, undergraduate and graduate students, college instructors, and the general public, introducing unique educational content while broadening the participation of groups largely underrepresented in Science, Technology, Education, and Mathematics (STEM). In addition to his role as the MRSEC Administrator, Dr. Wesley Francillon (Co-Outreach Director) coordinates overall operations of the E&HR program, working in tandem with the Co-Director of MRSEC Outreach, Dr. Andre Adler, who has the primary responsibility for outreach to New York City K-12 schools. All members of the Center – graduate students, postdocs, and faculty investigators – participate in the program, which serves as a wraparound model for recruitment and retention of students of all ages in STEM while creating pathways for STEM careers. We hope that you enjoy this inaugural issue, and we invite members of the NYU community to collaborate with the Center to advance the University's mission in widening the STEM pipeline.
The Scientific Frontiers Program (SFP) is a multifaceted educational enrichment activity designed to introduce students, teachers, parents and administrators from selected schools in New York City to scientific principles in a classroom-like environment. Through direct involvement of Center investigators, the SFP offers competency-matched content spanning three educational tiers – elementary, middle and high school – to more than 700 students annually. The Center hosts elementary school students, their teachers, administrators and family members for live demonstrations and hands-on activities. An essential element of STEM outreach is competency bridging – Center participants train high school juniors and seniors to become science apprentices and demonstrators, and these high school apprentices subsequently train K-4 and 5-8 groupings, providing an essential competency bridge between the K-8 students and Center participants as well as a valuable mentoring experience for the apprentices. Located in the largest and one of the most ethnically diverse school districts in the U.S., the SFP is positioned to broaden substantially the participation of groups that are underrepresented in STEM.

### K-12 PROGRAM

**Scientific Frontiers Program**

- More than 500 students annually
- More than 3,000 students over 6 years
- More than 30 faculty presentations
- More than 20 high school interns

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NYU Physics Lab

Thank you for letting us visit and learn from you!

Love, NEST + m
Class 1-216
K-12 OUTREACH

Mobile Materials Laboratory & Lower East Side Girls Club

MOBILE MATERIALS LABORATORY
The Center offers a materials curriculum on the BioBus, a converted transit bus that serves as a teaching laboratory on wheels, bringing hands-on scientific activities to young people at schools, community centers, and museums as well as to K-12 science teachers and the public. These activities, which range from holographic microscopy to crystals, are operated in collaboration with Biobus founder Dr. Ben Dubin-Thaler and emphasize the joy of discovery and foster scientific creativity by building on students’ own hypotheses. The NYU MRSEC continually expands its current suite of on-board lessons, often aligning content with the Scientific Frontiers Program. The BioBus now serves as a “Materials Bus” when in this mode, labeled prominently with the NYU MRSEC logo. The MRSEC also provides curriculum training to K-12 science teachers on the Bus through its Science Teacher Cross-Training initiative, and strives to deliver its materials curriculum to at least 1500 students at ten partner schools and 1,000 members of the public annually.

LOWER EAST SIDE GIRLS CLUB
The NYU MRSEC also partners with the Ben Dubin-Thaler in the BioBase, a new community project with the Lower East Side Girls Club aimed at the K-12 sector, which includes a 800 sq. ft. laboratory equipped with high-powered microscopes, a confocal microscope, long-term imaging stations, and a remote-controlled system. The facility includes a 30-person amphitheater for lecture-style demonstrations, a 4000 sq. ft. green roof with solar panels, native plants, and experimental gardens, a 30-foot planetarium dome for 3D renderings of molecules and physical processes, a commercial kitchen for molecular gastronomy, and a textiles shop to illustrate the materials science of ancient applications. NYU MRSEC faculty, graduate students, undergraduates and postdocs organize and participate in activities designed for junior high school students throughout the year.

• Mobile Materials Lab delivers materials curriculum to ~1500 students at ten partner schools annually
• MML delivers materials curriculum to ~1000 members of the public annually
• MRSEC REU students mentor Biobase campers at the LES Girls Club annually
REU

Summer Research Experience for Undergraduates

The NYU MRSEC draws REU students from numerous research universities as well as from a diverse consortium of more than 50 colleges and universities, the majority of which are minority-serving, from the Faculty Resource Network at NYU. Faculty members at these institutions partner with the Center to identify talented students. The Center strives to sustain, if not surpass, its historical level of minority student and women REU participants, which approaches 50% for each group. The summer program consists of a 10-week research experience in NYU MRSEC faculty groups, as well as activities aimed at professional development and cohort-building. The summer research program has become a magnet for other summer research programs and students, creating larger cohorts of students that enrich the summer experience. Through formalized agreements, the NYU MRSEC summer research program hosts students from the Swedish Royal Institute of Technology through the Chemical U.S. Travel (CHUST) organization, the International ACS program, and the Brazilian Scientific Mobility Program (BSMP), all fully supported by their sponsors. The Center partners with the CAS Research+ program, the NYU Tandon School of Engineering, the Columbia University MRSEC, and CCNY Chemistry and Chemical Engineering, hosting technical workshops, social activities, and a Summer Research EXPO at the end of the summer term. In addition to cultivating a larger and more diverse cohort of students and other participants, this effort is striving to build bridges between the sciences at Washington Square and the School of Engineering, as well as with other institutions in the NYC Metropolitan area.

- 102 Student participants: 2008-2015
- 46 Women and 42 members of underrepresented groups
- 58 Students from Four-Year Colleges and minority serving institutions

Summer REU 2015 group photo -- Washington Square Park

Graduate student Brismar Pinto and summer REU student Maria De Abreu Pineda
Faculty-Student Teams and Professional Development

FACULTY-STUDENT TEAMS

The Center also hosts Faculty-Student Teams from FRN schools and other four-year colleges, each comprising a faculty member and an undergraduate. This program creates a unique mentoring relationship between the visitors, enhances the research program of the visiting faculty member, reduces the barrier for students who are reluctant at first to venture alone to an REU program, and creates a permanent faculty contact between NYU and the home undergraduate institution.

The NYU MRSEC partnered with Xavier University of Louisiana, an HBCU, through an NSF Partnership in Research and Education in Materials (PREM) award to develop a materials science track at Xavier as well as research opportunities for its faculty. Although the five-year PREM award expired recently, the Center retains its connection to Xavier, which it views as an exceptional source of high-quality students interested in STEM graduate studies. Through its summer program, the NYU MRSEC also has forged very strong connections with the University of Puerto Rico, Rio Piedras, hosting a substantial number of UPR faculty members and undergraduates for summer research with the aim of guiding these students to graduate school and professional STEM careers. Though a rather new collaboration, its potential is evident from the large number of UPR participants in the REU program as well as a UPR REU student who returned to NYU Chemistry for graduate school and was awarded an NSF fellowship.

PROFESSIONAL DEVELOPMENT

The Center also is committed to the development of faculty from minority-serving institutions and other four-year colleges. The Center hosts materials-themed workshops during the Faculty Resource Network (FRN) Network Summer seminar series. Workshop modules are designed to introduce faculty to emerging topics in science emphasizing tangible lessons that can be introduced to their classroom. The workshops includes morning classroom sessions and laboratory exercises in the afternoons. The workshop participants return to their schools with the workshop content, which also is available to the public for free download on the Center website. The MRSEC also partners with the Chemists’ Club, a 501(c)(3) organization that provides networking opportunities for students and postdocs, mixing and meeting with events for professionals who share interests in the chemical industry.
COLLEGIATE- SCIENCE TECHNOLOGY ENTRY PROGRAM (C-STEP)
The Center is expanding its contacts with minority STEM undergraduates enrolled at NYU through the New York State Collegiate Science and Technology Entry Program (CSTEP). CSTEP students are required to complete a six-week introductory non-credit academic program during the summer prior to the freshman year intended to expose each student to first-year courses and activities and ensure a smooth entry into university life. The Center offers academic workshops and seminars to the CSTEP program, and it hosts CSTEP students within its summer REU program. The Center is engaging high school students in the Applied Research Innovations in Science and Engineering program (ARISE), which provides an intensive research experience in research labs for talented students in New York City underrepresented in STEM disciplines. In addition, NYU MRSEC supports the development of a Lab Lesson web platform, created by Professor Jin Montclare in the Tandon School of Engineering, based on the iPad app Lewis Dots. This instructional aid is available on iTunes and has been implemented in the Urban Assembly Institute for Young Women in Science and Technology. This efforts is being expanded to other NYC high schools and new virtual modules.

PUBLIC OUTREACH
The Center collaborates with Laura Newman, an alumna from the NYU Tisch School of the Arts, to produce science videos that convey science topics related to MRSEC research, featuring faculty investigators, K-12 students and teachers, and kids doing science. These videos represent an extremely effective mechanism for reaching a broader population. The video collection includes (1) Super Proteins and the Power of Self-Assembly; (2) Exploring the BioBus; (3) Fun with Photonics; (4) Particles and Pirates; (5) Crystals and Kidney Stones. The videos can be found on YouTube, NSF 360, Physics Front, and American Chemical Society, as well as the NYU MRSEC and NYU main Research Page.

- More than 70 high school STEP students participated in Materials workshops
- More than 60 C-STEP first year NYU undergraduates toured labs and attended science panel discussions

Science Video Vignettes

- Super Proteins and the Power of Self-Assembly
- Crystals and Kidney Stones
- Fun with Photonics
- Exploring the BioBus
- Particles and Pirates
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