



MRSEC-CHARM

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CHARM Program Expectations

<https://mrsec.org/centers/udcharm>

What is MRSEC?

The NSF Division of Materials Research funds 20 Materials Research Science and Engineering Centers (MRSEC) across the country. MRSECs support interdisciplinary materials research and education of the highest quality while addressing fundamental problems in science and engineering that are important to society. Read the [MRSEC program overview](#) to learn more about the importance of the network of MRSECs to materials research and education.

Core activities of NSF MRSECs include:

- Programs to stimulate interdisciplinary education and the development of human resources
- Knowledge transfer to industry
- Support for shared experimental facilities

NSF broader impacts

Scientists and engineers funded by the U.S. National Science Foundation are accountable to taxpayers for conducting research, and collectively moving their research beyond the lab to impact the public good, thereby benefitting the economy, society and discovery itself. This is what NSF defines as "Broader Impacts."

NSF funds scientists and engineers to perform research that advances discovery and innovation. The agency also expects researchers' work to have broader impacts: the potential to benefit society and contribute to the achievement of specific, desired societal outcomes. NSF does not want to be prescriptive about the societal outcomes a project addresses. Examples of desired outcomes include, but aren't limited to:

- **Inclusion** - Increasing and including the participation of women, persons with disabilities and underrepresented minorities in STEM.
- **STEM education** - Improving education and educator development — at any level — in science, technology, engineering and mathematics.
- **Public engagement** - Increasing public scientific literacy and public engagement with STEM.
- **Societal well-being**
- **STEM workforce** - Developing a more diverse, globally competitive STEM workforce.
- **Partnerships** between academia, industry and others

Acknowledging MRSEC support

Publications that do not properly acknowledge MRSEC support cannot be counted in our annual report to NSF. It is very important to acknowledge primary, partial and/or shared facilities support in publications, in presentations and on posters.

Suggested acknowledgement text for primary (partially) supported publications:

“This research was primarily/partially supported by NSF through the University of Delaware Materials Research Science and Engineering Center, DMR-2011824. Additional support received from . . .”

Suggested acknowledgement text for research performed using MRSEC supported facilities (instrumentation or computation):

“The authors acknowledge the use of facilities and instrumentation supported by NSF through the University of Delaware Materials Research Science and Engineering Center, DMR-2011824.”

Training in Responsible Conduct of Research

All undergraduates, graduate students, and postdoctoral researchers who will be supported by the NSF to conduct research are required to receive training in the ethical conduct of research. The Research Office provides this training once per year and you

must complete this training within one year of joining the center. Registration can be completed [here](#).

CHARM's Education and Outreach initiatives

NSF expects that all MRSEC members will participate in the center's education and outreach initiatives. The center relies on faculty and trainee volunteers to fulfill the NSF broader impacts mandate which is an extremely important aspect of our MRSEC. The center hosts a variety of activities throughout the year so that CHARM members can participate in a way that suits their availability and interests.

Research Experience for Undergraduates (REU)

- All REU students are assigned a faculty and graduate student mentor. The major activities of the REU include lab research projects; professional development programming; visits to local companies and National Labs (e.g., Dow, Under Armour, NIST); workshops on ethics; student mental health; scientific communication skills; the graduate school application process; and an end-of-summer research symposium.

TeenSHARP HighRise program

- CHARM's program with TeenSHARP provides a sustained and diverse research experience for underrepresented high school (HS) students, while also informing CHARM educators about HS preparatory skills. Students rotate through several CHARM labs, 2 weeks per IRG, where they participate in activities such as assisting mentors with ongoing research, completing short-term lab projects, and participating in specialized learning seminars. HighRise students also attend sessions to discuss topics around undergraduate research preparation (e.g., using bibliography software, preparing conference posters), soft skills (e.g., professional conduct in labs, networking), and the college application process. The goal of the program is to see continued student participation and increased knowledge of lab culture and techniques, scientific process, and research content with the ultimate goal as successful enrollment of students in an UG STEM program.

K-12 outreach activities (examples)

- **Meet a Scientist Day** - Meet-a-Scientist Day was held in collaboration with Delaware public libraries to bring scientific demonstration booths and College of Engineering lending library modules to the public. The event gave CHARM graduate students the opportunity to enhance and practice their scientific communication skills to a broad audience with a wide range of ages. Booths were developed to draw inspiration from students' research with an emphasis on accessible concepts that can be taught to the public and relate to materials science. Demos included Wiggly Worms (polymers), Tickling Tiny Magnets (magnetism, physics), You Spin Me Round

(angular momentum), Laser Light Show (reflection, refraction, & optics), and Color Separation Anxiety (chemistry, chromatography). Colburn Club (CBE) and Materials Research Society student chapter (MSE) also participated in the event. We plan to repeat this event in collaboration with the Delaware Museum of Nature and Science.

- **Science Olympiad** – CHARM utilizes Science Olympiad kits to teach physics, chemistry and biology to classrooms in rural and intercity schools that are otherwise unable to participate due to the cost. In addition to the kits, we're connecting teachers with several MRSEC-funded graduate students to provide mentorship to the students using the kits.
- **Exhibit at Delaware Museum of Nature and Science** – IRG2 members volunteered to collaborate with the Delaware Museum of Nature & Science to bring a hard-materials-focused laser exhibit to the Museum's newly built Discovery Gallery, aimed to educate K-12 visitors and school groups on modern STEM research.

MRSEC Fellows

- CHARM works with the Partnership for Research and Education in Materials (PREM) seed at Delaware State University and Claflin University. PREM is an NSF-funded program that stimulates collaborative research and education partnerships between minority-serving colleges and universities and the NSF Division of Materials Research (DMR)-supported centers and facilities. In addition to research collaborations between the institutions, CHARM is also establishing a MRSEC Fellows program which provides up to 3-year Fellowships for chosen students with the goal of launching well-prepared and eager students into graduate programs with a high probability of success in the classroom and in research. A goal will be the expansion of this program outside of CHARM, which will be possible through the College of Engineering's Dual Degree Program launching in a similar timeframe as the MRSEC Fellows program.

CRESP evaluation

CHARM works closely with the Center for Research in Education and Social Policy to evaluate center leadership and effectiveness. CRESP assesses the links between inputs, activities, and outputs, shorter-term outcomes, and longer-term outcomes of each aspect of the MRSEC via 'pre', 'post' and longitudinal surveys. CHARM's assessments separately focus on the REU, the MRSEC Fellows, the HighRise program, early-career faculty growth, Seed grants, and overall MRSEC management. Results are supplemented by IAB, EAB, and internal CHARM feedback, and reviewed at Executive Committee (EC) meetings and Annual retreats.

CRESP conducts online, anonymous surveys to provide feedback to CHARM leadership so that we can improve our center. CRESP also conducts focus groups and one-on-one interviews with CHARM faculty and trainees to ensure that we are providing the support, resources, educational and professional development opportunities that most benefit members of CHARM. CHARM participants are notified in advance of upcoming surveys and focus groups. Your participation in these surveys is critical to the center so that we can continuously improve.