Research Experience for Teachers (RET)

The Nebraska Nanoscale Facility is planning to host the Summer 2021 RET program in-person. If we cannot do so safely, we will shift to a hybrid or virtual experience.

The Nebraska Nanoscale Facility (NNF) is now accepting applications from high school teachers as well as community college educators for its 2021 summer RET program as part of the National Nanotechnology Coordinated Infrastructure (NNCI) program. Teachers will be selected to participate in research in nanoscale science and engineering labs at the University of Nebraska-Lincoln to gain hands-on experience in the cutting edge techniques and tools used within NNF facilities**.** This RET program is in partnership with other RET sites throughout the US providing teachers an opportunity to network with scientists and teachers across the country about big ideas in nanoscale science and engineering.

Teachers will spend time designing curricular materials to use in their classroom and will share these teaching materials during the program and after they return to their home institution. Be a part of a national initiative this summer learning about nanoscience research, creating your own curriculum, and discovering new ways to teach science and engineering.

Application

Applications Due: Friday, April 16, 2021

Eligibility: Must teach science or technology in grades 9-12 OR Community College

APPLY HERE!
https://docs.google.com/forms/d/e/1FAIpQLScMQzGMTUchvZkt9zpyRZPcB6T4l9jUPLhAZDgrWXCYpn3WGA/viewform?vc=0&c=0&w=1&flr=0

Questions? Please Contact: Terese Janovec (tjanovec3@unl.edu) or Steve Wignall (swignall4@unl.edu).

Program overview

- **Schedule:** June 14 – July 23, 2021
- **$5,000 summer stipend** (additional funding available for curricular materials, lesson plan/curriculum dissemination and travel to NSTA National Conference, March 31 – April 3, 2022, Houston TX)
- **US Citizenship required**
- **Program requirements:** Participants will need to attend all daily and weekly meetings, seminars, field trips, and workshops during the entire program
- **Follow-up activities:**
    - Curriculum implementation during the academic year
    - Participation at the National Science Teaching Association (NSTA) conference (NNCI booth, presentations)
    - Publication of RET modules on the NNCI web site

Development of Curricular Modules

High school teachers and community college educators will develop modules and curricular materials to bring their research back into their classrooms. The modules will directly relate to the research of the NNF lab where each teacher is hosted. At the same time, teachers will be supported in ensuring that the modules are directly related to the high school/community college curricula required at their teaching sites. All participants will conduct a research study; example projects are listed below

Sample RET Projects

Note: These are provided as an example of the types of experiences you can expect. We will update this list as more projects are added and finalized.

"Engineered Nanoparticles"
Complex nanoparticles formed via physical processes offer the opportunity to explore new states of matter, as this far-from-equilibrium processing route can create novel structures and chemical arrangements with unique magnetic properties for use in biomedical or data storage applications. Numerous research projects on our nanoparticles or thin film structures have involved undergraduate researchers [4] and teachers [13], who use the deposition systems and perform x-ray diffraction to study structure, AFM to analyze size, and magnetometry. *Teacher and/or Community College Faculty component:* The teacher will learn to deposit alloy nanoparticles, and then characterize them using the above-mentioned techniques as well as scanning/transmission electron microscopy.

"Additive Manufacturing/3D printing of metals"

The singular design and material flexibility offered by metal additive manufacturing (AM) processes can improve performance, reduce waste, and lower processing costs across critical industries, including aerospace, biomedical, automotive, and defense. For instance, an aerospace part weighing just one pound requires subtractive machining of 20 pounds of raw material (a buy-to-fly ratio of 20:1). Using metal AM, the buy-to-fly ratio reduces to 4:1. There is also significant savings of energy and time, reducing lead times from weeks to days. AM also allows for novel part design due to the expanded manufacturability of complex parts. For instance, General Electric's new jet engine includes an AM-produced single-piece nozzle, a design that once contained 20 separate parts, while the Cessna Denali aircraft engine now has 12 AM-produced parts rather than 855. In both cases, there was an overall reduction in weight and an improvement in fuel efficiency of more than 10% [5]. AM also allows for the easy reproduction of legacy parts and custom design for biomedical implants.
In our group, we analyze the microstructural evolution of AM-processed parts in order to understand the effect of processing parameters and part design on performance. We utilize various forms of microscopy, including optical and scanning electron, as well as measure mechanical performance. As for AM, we utilize laser powder bed fusion, directed energy deposition, and wire arc techniques. The ultimate goal is to ensure that every part has predictable properties.