

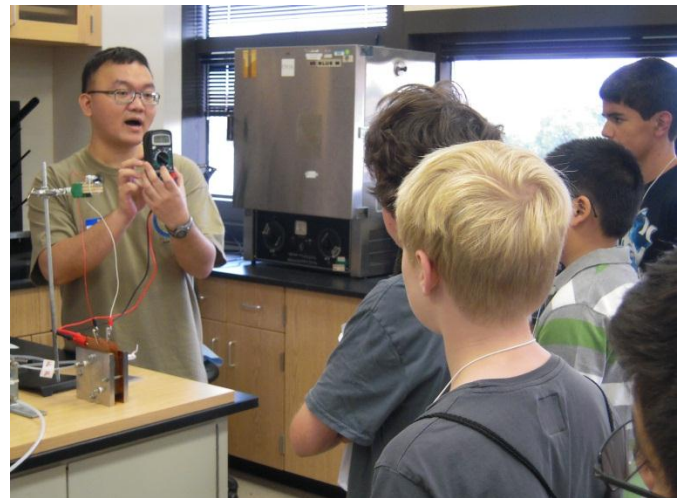
February 2012  
Material Advantage: K-12 Outreach

## University of Texas at Arlington

The University of Texas at Arlington Material Advantage Chapter has a summer camp annually to help middle and high school students get more understanding about MSE.

This one day camp is designed for middle and high school students' ages between 12 and 16, and exposes them to the world of Materials Science and Engineering. The camp provides an opportunity for the students to learn more about properties of materials including metals, ceramics, polymer and semiconductors. They learn how materials break by examining fracture surfaces under electron microscopes. How microstructures of materials are developed using metallography and microscopy. They learn how solar cells are made and examine the physical characteristic of solar cells, and how nanoparticles of magnetic material are made and characterized. In nutshell, this one day summer camp educates students with materials' mechanical properties, electrical properties, optical properties & magnetic properties, along with their characterization and application. The camp includes a tour of UTA's nationally recognized Nanofab and a show at the UTA Planetarium. The North Texas Chapter of ASM International and the Materials Science and Engineering Department at The University of Texas at Arlington support the camp.

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## Iowa State

The Iowa State University Chapter of Material Advantage (ISU MA) prides itself on the outreach activities it provides and continually strives to teach open minds about the exciting world of materials science and engineering. Our chapter has an extensive set of demonstrations that quickly and effectively introduce new audiences to materials. Since an overwhelming number of Iowa State Materials Engineering students cite materials demonstrations as a major influence in deciding to pursue materials engineering, we understand the influence and importance of our demonstrations.

The outreach done by ISU MA can be split into three categories: recruitment, classroom, and special events. Our group is frequently asked by the university or the engineering college to perform our demonstrations on campus for prospective students. In most recruitment events demos are performed amidst personal conversations sharing information about the university as a whole, engineering in general, and specifically Materials Science. In the second category, ISU MA members travel to numerous schools across the state and the region giving presentations and helping with activities for students from early elementary through high school. There are thirdly numerous special events our chapter helps with. ISU MA does demonstrations for Boy and Girl Scouts, VEISHEA (an annual Iowa State University celebration), after school programs, summer camps, and many more. Although our group is frequently approached with opportunities for outreach, contacting groups and expressing an interest in performing demonstrations is also important to spread enthusiasm for Materials Science.

The overall goal is for the set of demonstrations to be both informative and fun for the level of the audience, whether explaining the concept of atoms for the first time or giving a more comprehensive view of the solid phase to upper-level chemistry students. To do this, the ISU MA kit includes demonstrations highlighting the differences and similarities between the four areas of materials (metals, ceramics, polymers, and electronics). The kit also highlights how different processing, structures, and chemical compositions combine to provide endless different materials. Some of the demonstrations performed are explained below; for a full explanation of all of the demonstrations ISU MA performs, contact Sam Reeve at [streeve@iastate.edu](mailto:streeve@iastate.edu).

### Steel Tempering

Two pieces of steel drill rod are heated using a propane torch and quenched in water; only one of the two is then tempered. Audience members test and observe the high strength, but low ductility in the tempered rod and the opposite properties in the second rod. The ubiquity of steel in industry is discussed.



## Tempered Glass

A pane of tempered glass is spanned across two chairs. The presenter stands on the pane and comments on the incredible amount of compressive strength that tempered glass possesses. The process of thermally tempering glass is discussed. The glass is then shown to be weak in tension by cutting the corner of the pane with a set of pliers. The manufacturing process and applications of tempered glass are discussed.



## Crystallography

Our chapter developed an activity that helps students visualize basic crystal structures while enjoying a tasty treat. The students are assisted in constructing models of face-centered cubic and hexagonal close-packed unit cells using bubble gum and hot glue. Once constructed, the students have models that are helpful for visualizing and explaining slip planes, interstitial sites, atomic packing, and more.

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## Virginia Tech

MEPS and the VT MSE department work with NSBE (the National Society of Black Engineers) to show students from some nearby counties what MSE studies. There are generally 50-60 students in grades 5th-12th. We try to show non-intuitive material behavior and then tie that to engineering topics and the impact of materials engineering specifically. Ideas commonly used include the glass transition temperature of polymers, crystal growth from solution, and levitation from the Meissner effect. We also spend some time between sessions talking with the visiting students about engineering and college life in general.

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