NOVA PBS MAKING STUFF WITH DAVID POGUE

Tips for Helping a General Audience Understand Smarter Materials

The goal of the "Making Stuff" outreach campaign is to help people appreciate and gain a better understanding of the material world. As you (or your invited speaker) prepare your 10- to 12-minute presentation, consider organizing your remarks so that the audience will leave understanding the **Big Ideas**. Use the **Conversation-Starter Questions** as a way to kick off a general discussion.

Big Idea #1: Smart materials change purposefully in response to their environment.

All materials change in response to their environment. Most materials expand when heated, for example. Smart materials are designed by materials scientists and engineers to respond to changes in their environments—often in unusual or dramatic ways to achieve a specific purpose. For example, one type of smart material, a shape-memory material, can be programmed to return to a previously set shape when exposed to certain change in its environment. Some shape-memory materials display their shape-shifting properties when exposed to heat, certain wavelengths of light, changes in the magnetic field, electrical currents, or chemical solutions. Other types of smart materials can change viscosity, volume, or color, or produce electricity.

conversation-starter question: HOW CAN A MATERIAL BE SMART?

Big Idea #2: Smarter materials can make smarter stuff.

The use of smart materials in products opens up a new world of possibilities. For example, a material's ability to change shape is useful in applications such as stents that hold open arteries (body heat expands the stent into place), clothes embedded with shape-memory strips that cause the clothes to unwrinkle when worn, or car parts that easily snap back to their original shapes after an accident.

Imagine airplane wings that can change their shape smoothly in mid-flight, as birds do, which could make airplanes more maneuverable and energy-efficient. With the promise of new smart materials that can change shape when exposed to an electric field, such smarter airplanes become possible.

Researchers are working to develop a smart fabric that senses the presence of blood and sends a signal to a handheld computer, alerting doctors that an unconscious combat soldier may be injured. Another potential application is a piezoelectric city sidewalk that senses the pressure of footsteps and converts that kinetic energy into electric current that can power streetlights and buildings. Smart materials can revolutionize engineering, medicine, and everyday life.

conversation-starter question: WHY DO WE WANT SMARTER MATERIALS?