NOVA PBS

MAKING STUFF WITH DAVID POGUE

Tips for Helping a General Audience Understand Smaller 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: Nanotechnology is very, very small.

Nanotechnology involves engineering new materials out of individual atoms and molecules. Nanoscale objects are billions of times smaller than everyday objects measured on the macroscale.

- Macroscale: Objects on this scale are measured in kilometers, meters, centimeters, and millimeters. Examples include a house, a dog, the thickness of a dime, the width of a pinhead.
- Microscale: Objects on this scale are measured in millionths of a meter. Examples include human hairs (about 200 micrometers), pollen, red blood cells, bacteria.
- Nanoscale: Objects less than 100 nanometers (billionths of a meter). Examples include viruses, the width of strands of DNA, the thickness of a cell membrane.

Making materials on the nanoscale requires tiny tools and special techniques. Bottom-up approaches build structures atom by atom; for example, the chemical properties of atoms can cause them to naturally self-assemble (under proper conditions) into larger structures. Alternatively, nanostructures can be created using a top-down approach by carving down larger materials.

conversation-starter question: HOW CAN WE MAKE STUFF SMALLER?

Big Idea #2: Nanotechnology creates incredible possibilities.

Yesterday's room-sized supercomputers are today's miniature microchips. New electronic devices are more portable, cost less to make, consume less power, and have longer-lasting batteries. Replacing silicon with a newly discovered form of carbon called graphene, which is a single-atom thick layer of carbon, may lead to new computer chips that allow electrons to move 1,000 times faster, making computers even more powerful. But how small can we go? How much power and performance can we squeeze out of ever-shrinking microchips?

The promise of nanotechnology goes beyond smaller, more powerful computers. Picture a TV screen that's a flexible film that you could roll up and put in your pocket. Or e-paper embedded with invisible nanowires that has the appearance of natural paper, but is digital. Or new medical procedures to remove tumors without surgery or deliver medicine only where it is needed.

conversation-starter question: HOW CAN NEW MATERIALS PUSH TECHNOLOGY BEYOND OUR CURRENT LIMITS?