At the Nanoscale

Summary

"At the Nanoscale" is a static component that aims to show just how super small one billionth of a meter, or one nanometer, really is. It is mounted to the backside of the *Intro to Nanotechnology* video kiosk. The copy panel and video monitor guide visitors through the concept of scale way down at the nano level.

A Billion Beads

A Billion Beads is an activity where visitors inspect tubes that hold quantities of one thousand tiny beads, one million beads, and one billion beads. To the naked eye, the tube containing one thousand beads appears nearly empty. Visitors see that the next tube, partially filled, contains one million beads. Finally, to compare, a four-foot tall container nearly full contains approximately one billion beads.

This multimedia static component consists of one copy panel, three containers that hold different quantities of beads, and a flat-screen monitor that scrolls through various slides. Like all of the exhibit components in the *Intro* package, headphone listening stations with both English and Spanish audio description labels are included. These audio labels serve two functions—to explain the "Big Idea" content of the exhibit and to provide illustrative descriptions of the interactive experience.

Learning Goal

- Things at the nanoscale are super small.

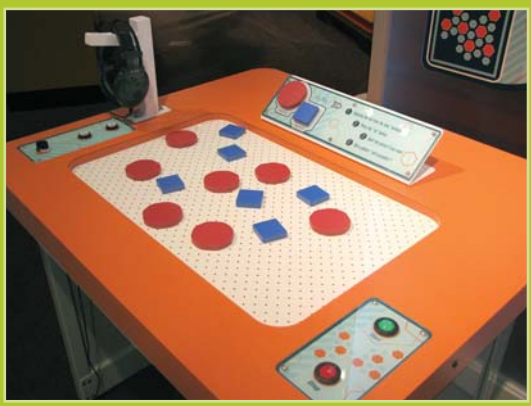
Exhibit Details

Audience: 7 and up

Exhibit Format: Stand-Alone Exhibit Component
Part of *Introduction to Nanotechnology* package

Exhibit Dimensions: 54"w x 31 ½"d x 78"h

Creating Nanomaterials



Summary

"Creating Nanomaterials" is an interactive, multimedia component of the *Intro to Nanotechnology* exhibit package that demonstrates how scientists are using the ability of molecules to self-assemble to create consumer goods with surprising properties.

Self-Assembly

Self-Assembly is an interactive where visitors place and observe "molecules" on an air hockey table. When the air hockey table is activated, the "molecules" hover and assemble into patterns all by themselves—just like molecules in nanomaterials. The copy panel and side monitors explain how self-assembly is being used to create novel materials in real-world applications.

This exhibit component consists of one copy panel, the air hockey Self-Assembly interactive, and a flat-screen monitor slideshow that can be updated to keep the exhibit content current and relevant. Like all of the exhibit components in the *Intro* package, headphone listening stations with both English and Spanish audio description labels are included. These audio labels serve two functions—to explain the "Big Idea" content of the exhibit and to provide illustrative descriptions of the interactive experience.

Learning Goal

- Scientists are figuring out how to create and manipulate materials at the nanoscale through self-assembly.

Exhibit Details

Audience: All ages

Exhibit Format: Stand-Alone Exhibit Component
Part of *Introduction to Nanotechnology* package

Exhibit Dimensions: 65 ½"w x 32 ½"d x 78"h

Unexpected Properties

Summary

"Unexpected Properties" is an engaging and interactive component featured in the *Intro to Nanotechnology* exhibit package that demonstrates how materials at the nanoscale can have very unexpected properties.

Quantum Dots

The tabletop interactive, Quantum Dots, focuses on the property of color and how a material's color may change when brought down to the nanoscale. Visitors alter the size of a magnified quantum dot and watch the light that it emits shift from red to blue as it shrinks to a fraction of a nanometer. The copy panel and side monitors explain how unexpected properties are being used in real-world applications of quantum dots and nanoparticles, from medical imaging to consumer goods.

This exhibit component consists of one copy panel, the Quantum Dots interactive, and a flat-screen monitor slideshow that can be updated to keep the exhibit content current and relevant. Like all of the exhibit components in the *Intro* package, headphone listening stations with both English and Spanish audio description labels are included. These audio labels serve two functions—to explain the "Big Idea" content of the exhibit and to provide illustrative descriptions of the interactive experience.

Learning Goal

- Super small nanoparticles can have very unexpected properties.

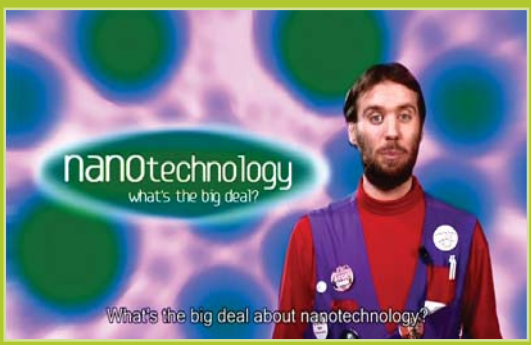
Exhibit Details

Audience: All ages

Exhibit Format: Stand-Alone Exhibit Component
Part of *Introduction to Nanotechnology* package

Exhibit Dimensions: 65 ½"w x 32 ½"d x 78"h

Intro to Nanotechnology Video



Summary

In this lively and engaging three-minute video, host Anders Liljeholm gives an overview to nanotechnology science. Anders explains some of the principles of nanotechnology, including the concept of the super tiny nanoscale, and how materials can behave differently at the nano level. Compelling examples of fascinating new consumer products, including self-cleaning windows and extremely efficient power lines, are presented, as well as medical applications of nanotechnology like new methods of cancer treatment. Visitors are introduced to some of the unique challenges and opportunities presented by nanoscale science and are left to consider what big changes may come from the small world of nanotechnology.

Nanotechnology: What's the Big Deal?

Nanotechnology: What's the Big Deal? is presented in both English and Spanish. Visitors select their preferred language by pressing the appropriate start button to launch the video. The exhibit component "At the Nanoscale" is attached to the backside of this video kiosk.

Learning Goals

- Things at the nanoscale are super small.
- Super small nanoparticles can have very unexpected properties.
- Nanotechnology is being used to create consumer goods with new and/or improved properties.
- Nanotechnology is being used in medical applications, such as the treatment of cancer.
- There may be risks associated with nanotechnology that include human health and the environment.

Exhibit Details

Audience: All ages

Exhibit Format: Stand-Alone Exhibit Component
Part of *Introduction to Nanotechnology* package

Exhibit Dimensions: 54"w x 31 ½"d x 78"h

Detecting Disease

Summary

"Detecting Disease" is a stand-alone interactive component of the *Nanomedicine* exhibition. A copy panel introduces visitors to some of the new ways of detecting and monitoring disease on the nanoscale with genetic material.

GreeneChip

A computer/mechanical interactive, GreeneChip, demonstrates how a newly developed detection tool tests simultaneously for nearly 2,000 pathogens all at the same time. In this interactive, the visitor gets to conduct a lab test. They select one of three sick patients and use a real pipette to add the patient's blood sample to a glass slide (the GreeneChip). A short animation zooms up close to show how tiny segments of pathogen DNA "stick" to the GreeneChip. The visitor then positions the GreeneChip under the scanner and presses scan. The correct diagnosis is then listed on the computer screen, and the visitor is invited to test another patient.

This exhibit component consists of one copy panel, the tabletop GreeneChip interactive, and a flat-screen monitor slideshow that can be updated to keep the exhibit content current and relevant. Like all of the exhibit components in the *Nanomedicine* package, headphone listening stations with both English and Spanish audio description labels are included. These audio labels serve two functions—to explain the "Big Idea" content of the exhibit and to provide illustrative descriptions of the interactive experience.

Learning goals:

- Nanotechnology is being used to develop new diagnostic tools that work better than traditional methods.

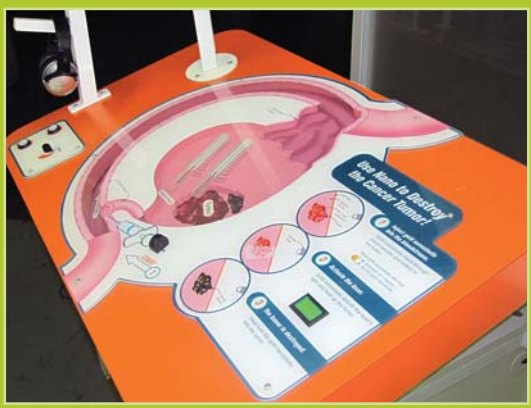
Exhibit Details

Audience: 11 and up

Exhibit Format: Stand-Alone Exhibit Component
Part of *Nanomedicine* Exhibit package

Exhibit Dimensions: 65 ½"w x 32 ½"d x 78"h

Treating Disease



Summary

"Treating Disease" is a stand-alone interactive component of the *Nanomedicine* exhibition. Visitors read about cutting-edge medical treatments that are being developed with nanotechnology.

Gold Nanoshells

The tabletop interactive, Gold Nanoshells, demonstrates how tiny nanoparticles (gold nanoshells) are being used to destroy cancerous tumors. Visitors inject gold nanoshell marbles into the bloodstream and watch as the gold nanoshells are absorbed by cancerous cells. The visitor then activates an infrared laser and watches as the laser heats up and kills the tumor cells while leaving the healthy tissues unharmed.

This multimedia static exhibit consists of one copy panel, the tabletop Gold Nanoshells interactive, and a flat-screen monitor slideshow that can be updated to keep the exhibit content current and relevant. Like all of the exhibit components in the *Nanomedicine* package, headphone listening stations with both English and Spanish audio description labels are included. These audio labels serve two functions—to explain the "Big Idea" content of the exhibit and to provide illustrative descriptions of the interactive experience.

Learning Goals

- Nanomedicine treatments use materials that are as small (or even smaller!) as the tiniest parts of cells in the body.
- New nano treatments may work better and have fewer side effects than current medical treatments.
- One example of nanomedicine is the use of gold nanoshells to kill cancerous cells without harming healthy cells.

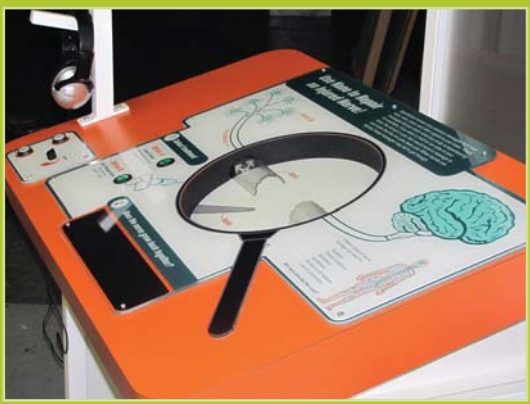
Exhibit Details

Audience: 11 and up

Exhibit Format: Stand-Alone Exhibit Component
Part of *Nanomedicine* Exhibit package

Exhibit Dimensions: 65 ½"w x 32 ½"d x 78"h

Regenerating Tissues



Summary

"Regenerating Tissues" is a stand-alone interactive component of the *Nanomedicine* exhibition. A copy panel describes how nanomaterials are able to form tiny structures called nanoscaffolds that help the body repair damaged muscle, bone, and nerve tissues.

Nanoscaffold

Nanoscaffold is a mechanical interactive that demonstrates how nanotechnology can help the body repair a damaged nerve. When the visitor approaches this interactive, they see a severed nerve that no longer functions. Sensory messages, indicated by chasing LED lights, originate at the nerve cells on the left but cannot get through to the brain on the right. The visitor has two options: to leave the injury alone or to inject nanoparticles. When nanoparticles are injected, they self-assemble into a nanoscaffold. Visitors can watch as the nerve endings grow back together, and sensory messages are once again able to reach the brain.

This exhibit component consists of one copy panel, the tabletop Nanoscaffold interactive, and a flat-screen monitor slideshow that can be updated to keep the exhibit content current and relevant. Like all of the exhibit components in the *Nanomedicine* package, headphone listening stations with both English and Spanish audio description labels are included. These audio labels serve two functions—to explain the "Big Idea" content of the exhibit and to provide illustrative descriptions of the interactive experience.

Learning goals:

- Researchers are working on ways to repair tissues with nanotechnology.

Exhibit Details

Audience: 11 and up

Exhibit Format: Stand-Alone Exhibit Component
Part of *Nanomedicine* Exhibit package

Exhibit Dimensions: 65 ½"w x 32 ½"d x 78"h

Nanomedicine Explorer

Summary

“Nanomedicine Explorer” is an interactive media station. Voice your opinion in a nomedicine poll, meet researchers, and learn how nanotechnology is being used to treat and diagnose diseases. An optional web connection automatically updates the station with current nanomedicine news and allows visitors to send themselves a link to Nanomedicine Explorer online.

Nanomedicine Explorer requires a data line for nanomedicine updates and email functionality.

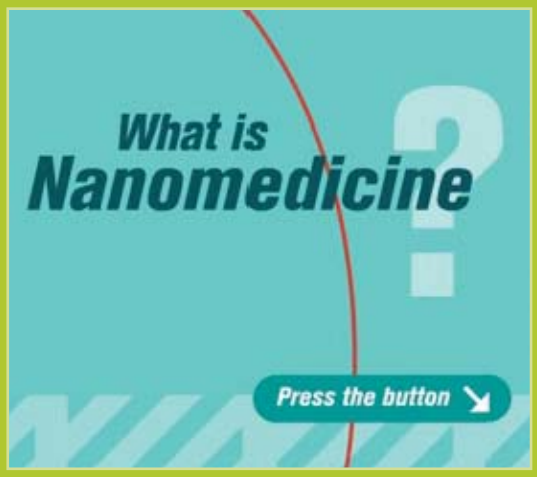
Exhibit Details

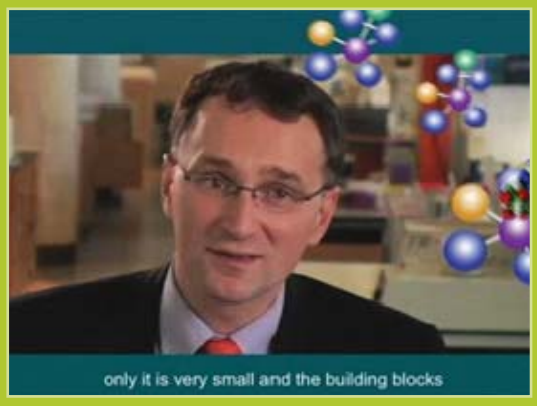
Audience: All ages

Exhibit Format: Stand-Alone Exhibit Component

Exhibit Dimensions: 52”w x 32 ½”d x 78”h

Intro to Nanomedicine Video





Summary

What is Nanomedicine?

"What Is Nanomedicine?" is the introductory video for the *Nanomedicine* exhibit package. The structure includes a text panel and a narrated and captioned 2.5-minute video that plays on demand in either English or Spanish on a 32-inch LCD screen. The video's colorful animation and researcher commentary complements the accompanying text panel to provide a brief overview of some of the basic ideas and goals of nanomedicine.

Learning Goals

- Nanomedicine is the application of nanotechnology to medicine.
- New medical treatments are being developed with the tools provided by nanotechnology.
- New treatments will need to be tested before they are available to the general public.

Exhibit Details

Audience: All ages

Exhibit Format: Stand-Alone Exhibit Component
Part of *Nanomedicine* Exhibit package

Exhibit Dimensions: 54"w x 31 ½"d x 78"h

Bump and Roll

Summary

"Bump and Roll" is an interactive exhibit that demonstrates nanomaterial properties using an everyday object: a leaf of cabbage. The nanoscale structures on a cabbage leaf cause water to bead up and slide off its surface. Scientists are replicating these "superhydrophobic" properties with nanotechnology. Drip water onto a cabbage leaf, and change the angle of the surface to see how the droplets behave. Find out about the super-small bumps that make this surprising behavior possible.

Cabbage leaves must be replaced every few days, and Bump and Roll's water tank must be refilled occasionally.

Big Idea

- Nanoscience is harnessing nanoscale phenomena seen in nature to create new techniques, materials, and products.

Learning Goals

- Tiny micro and nanoscale bumps can make surfaces water-repellent and self-cleaning.
- It's fun to play with water on a superhydrophobic surface, but there are lots of practical applications of the technology.

Exhibit Details

Audience: All ages

Exhibit Format: Stand-Alone Exhibit Component

Exhibit Dimensions: 65 ½"w x 32 ½"d x 78"h

Way to Glow

Summary

"Way to Glow" is an interactive exhibit that shows how some high-tech nanomaterials mimic natural phenomena. Super-small, light-reflecting structures—instead of pigments—on the wings of some butterflies create intense, iridescent colors. Nanoscientists have replicated this effect with layered, super-thin films. Watch the colors change on butterfly wings and thin-film slides as you move them beneath a light source, and discover how nanoscale structures can manipulate light and create color.

Butterfly specimens deteriorate with heavy use, and may need to be replaced periodically.

Big Idea

- Nanoscience is harnessing nanoscale phenomena seen in nature to create new techniques, materials, and products.

Learning Goals

- The butterfly scales and thin films contain no pigment.
- The butterfly scales and thin films are made up of layers of super thin, transparent materials. The spacing between the layers causes only certain light waves to bounce back to our eyes as colors.
- When you change the angle of the light, you change the color.

Exhibit Details

Audience: All ages

Exhibit Format: Stand-Alone Exhibit Component

Exhibit Dimensions: 65 ½"w x 32 ½"d x 78"h

Fact or Fiction?

Summary

Nanotechnology: Fact or Fiction explores the reality and fiction of nanoscale science. Graphic panels contrast real products that apply nanotechnology with fictional examples of nanobots. In the construction area, visitors create their own models of an imaginary nanobot using colorful toy parts. In the display area, they can fill out a card explaining what their nanobot is designed to do, and display their creations for others to see. A wall graphic and picture book called “Is that robot real?” explore the challenges facing the development of very small robots, and explain that nanobots currently do not exist.

Big Idea

- Many real examples of nanotechnology do exist, but others (such as nanobots) are imaginary.

Learning Goals

- Nano is very, very small.
- Nanotechnology is real and can be found in applications such as clothing and sports equipment.
- Nanobots are not real and do not currently exist.
- There are many challenges related to creating a nano-sized robot.
- In the future, nanobots might exist and might be able to do useful things.

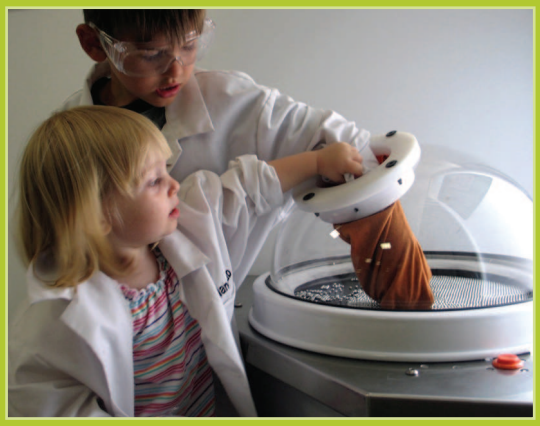
Exhibit Details

Audience: All ages

Exhibit Format: Stand-Alone Exhibit Component
Part of the *Nanolab+Fact or Fiction* exhibition

Exhibit Dimensions: 6’ deep x 10’ wide x 7’ tall

NanoLab



Summary

"Nanolab" is a component of the *Nanolab+Fact or Fiction* exhibition, with separate activities and interactives aimed at a wide range of visitor ages. Nanoscientists use special devices and laboratories to build and manipulate materials on the nanoscale. Dress up like a scientist, or examine clothing and objects found in real clean room nanoscience laboratories. Watch a video on nanoscale research, play with interactive exhibits, or explore the resource area for materials on nano-technology and the basics of nanoscale science.

Big Idea

- Some nanoscientists work in labs called clean rooms, where they learn about and make things that are too small to see.

Learning Goals

- In nano labs, scientists learn about and make things that are too small to see.
- Many different scientists work in nano labs.
- Some nano labs are clean rooms.
- In clean rooms, scientists build with atoms.
- Scientists who work in clean rooms use special tools and equipment.
- Scientists who work in clean rooms wear special clothes.
- Nano is very, very small.

Exhibit Details

Audience: All ages

Exhibit Format: Stand-Alone Exhibit Component
Part of the *Nanolab+Fact or Fiction* exhibition

Exhibit Dimensions: 12.5' long x 10.5' wide x 7' tall