

NanoDays





Presentation Overview

Intro to NanoDays

- NanoDays nationwide
- Our NanoDays event

Engaging the public in nano

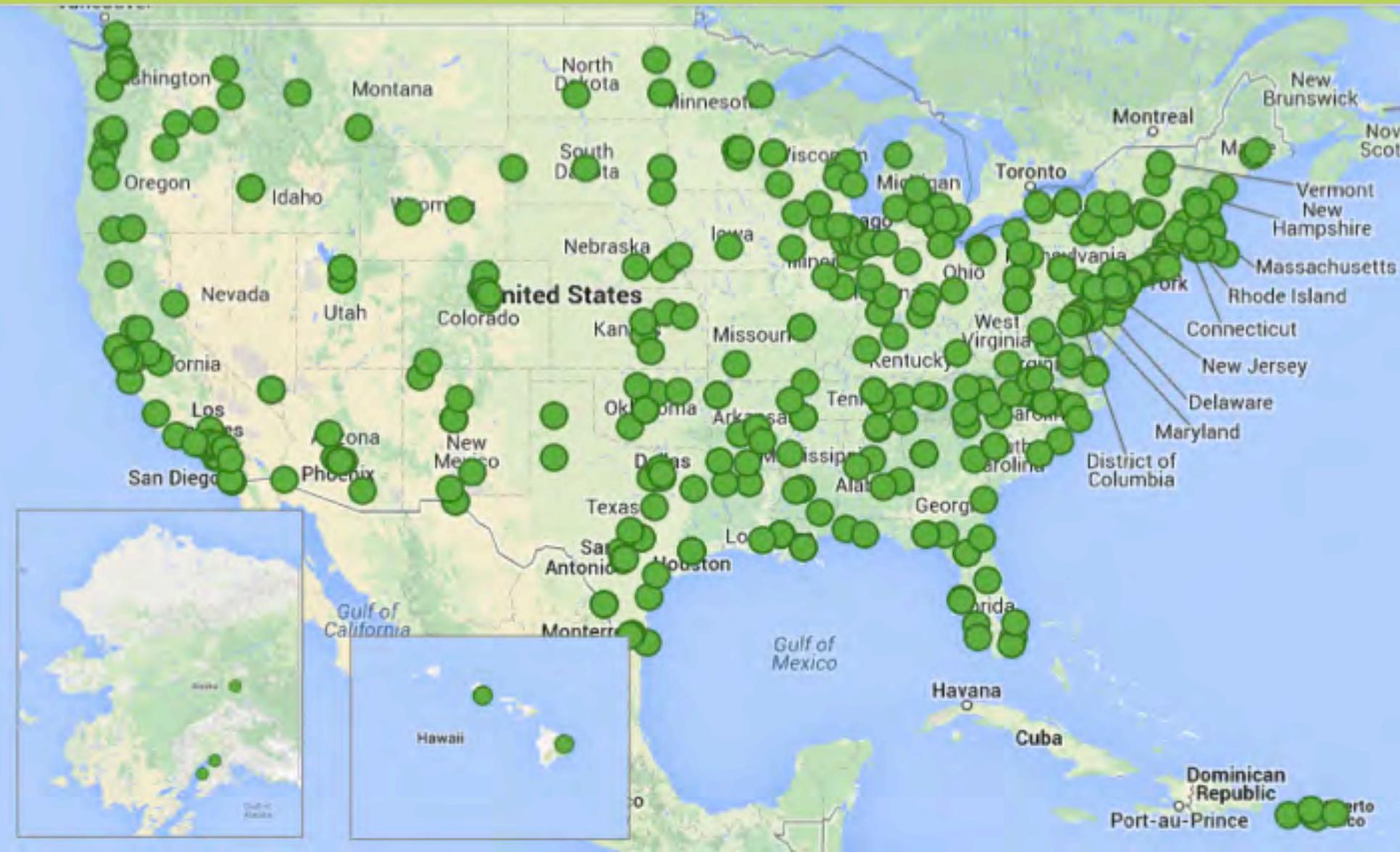
- What is nano?
- NanoDays activities

NanoDays is...



- a nationwide event celebrating nanoscale science and engineering
- organized by the Nanoscale Informal Science Education Network (NISE Net)
- held in all 50 states of the US, as well as other countries
- hosted at more than 250 sites each year
- enjoyed by over 470,000 participants annually

NanoDays Sites (2008-2014)



NanoDays 2014 Evaluation



In 2014, the NISE Network conducted an evaluation of NanoDays events

- Data was gathered from adults, children, and volunteers attending NanoDays events
- 325 volunteers across the nation filled out a survey (if you filled out a survey last year—THANK YOU for your help!)

NanoDays Evaluation Findings



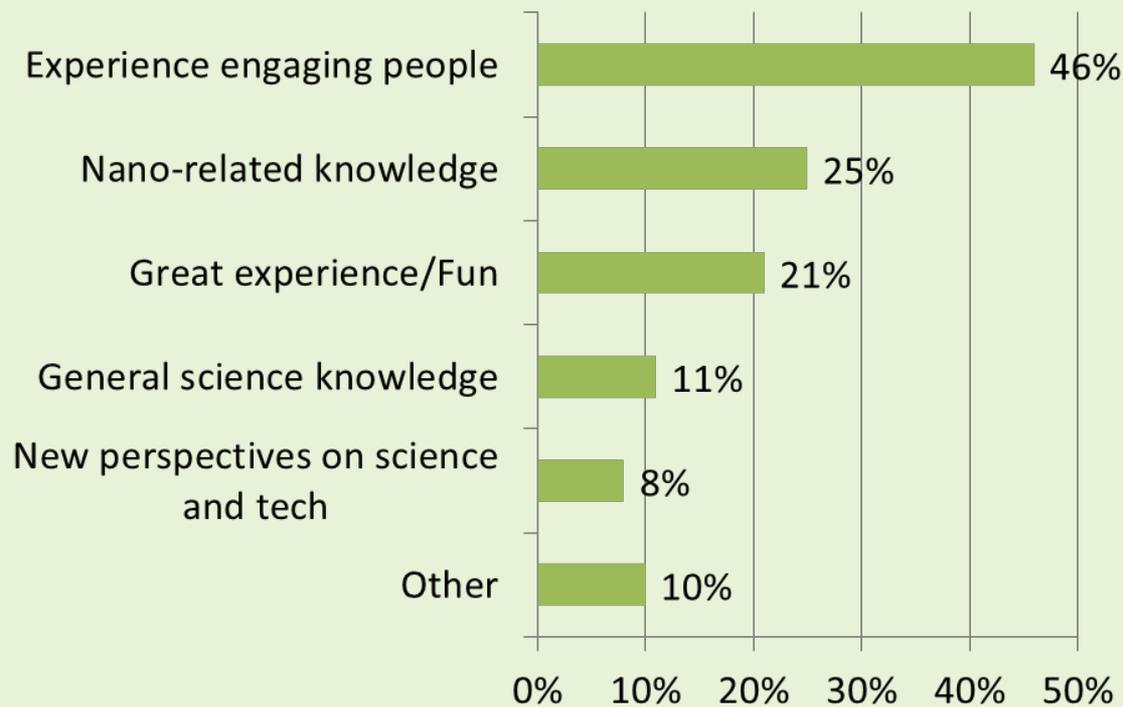
Volunteers help make NanoDays engaging and educational for adults and children

- 63% of adult attendees report learning something at NanoDays that connects to an aspect of their own life
- 88% of children interviewed identified specific aspects of NanoDays activities when asked about new technologies

NanoDays Evaluation Findings

Volunteers are impacted by their NanoDays involvement in many ways

- When asked what they gained from their NanoDays volunteering experience, volunteers mentioned:



Our NanoDays Event



- Background
- Who's here
- Orientation
- Safety
- Policies
- Schedule





Engaging the Public in Nano

What is Nano?



Key concepts:

1. Nano is small and different.
2. Nano is studying and making tiny things.
3. Nano is new technologies.
4. Nano is part of our society and our future.



NanoDays Kit Activities

Key concept 1: Nano is small and different.

Exploring Materials— Stained-glass Windows

How can gold look red?



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The Biggest Event
for the
Smallest Science!

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Exploring Materials— Thin Films

Can clear things be colorful?



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Exploring Materials— Graphene

*Can you make the world's
thinnest material?*



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NanoDays Kit Activities

Key concept 2: Nano is studying and making tiny things.

**Exploring Tools—
Dress Up Like
a Nanoscientist**

Pretend you're working in a nano lab!

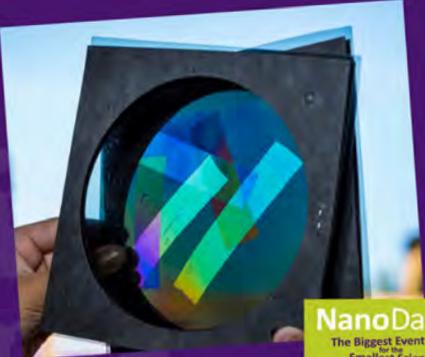


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**Exploring Materials—
Polarizers**

*How can clear tape make
rainbow colors?*



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**Exploring Tools—
Transmission
Electron
Microscopes**

How do scientists study tiny things?



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NanoDays Kit Activities

Key concept 3: Nano is new technologies

**Exploring Products—
Nano Fabrics**

Can you spill without making a mess?



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**Exploring Properties—
Heat Transfer**

How do we keep computers from overheating?



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**Exploring Products—
Kinetic Sand**

Why does this dry sand seem wet?

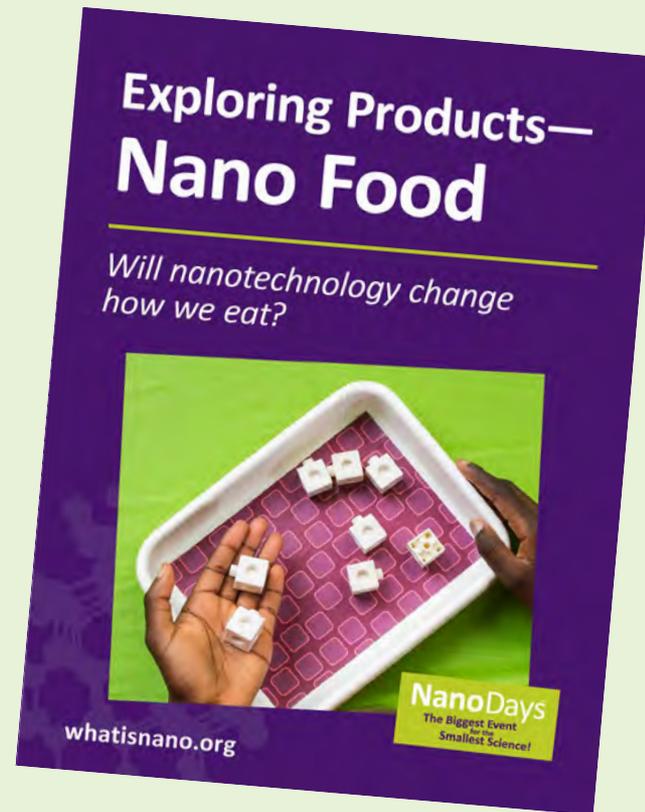
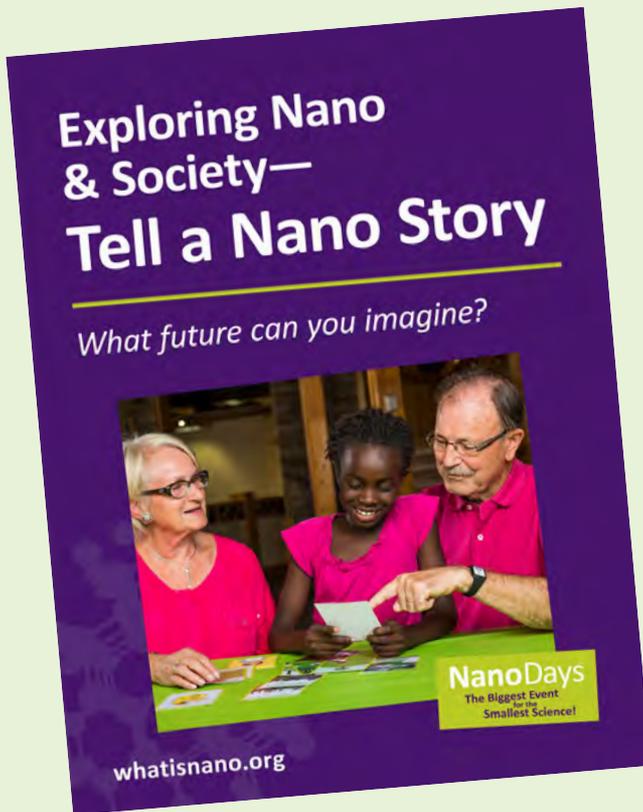


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NanoDays Kit Activities

Key concept 4: Nano is part of our society and our future



Inside the Box

Activity Guides

On the front:
Instructions for visitors

On the back:
Information for presenters

NanoDays
The NanoDays Event for the Smartest Scientist!

Exploring Materials—Stained-Glass Windows

Try this!

1. Peel the backing off of one piece of contact paper.
2. Place pieces of colored tissue paper on the exposed adhesive side to create a design. Use the black construction paper strips to create a border.
3. Peel the backing off the other piece of contact paper and stick both adhesive sides together. Trim your artwork. You can even cut out a special shape.
4. Now hold your design up to the light or window. What do you notice?



What's going on?

In your artwork, the different pieces of tissue paper have different colors because they contain different dyes. These dyes were added to the paper pulp during the paper production process.

Now, take a look at the samples of real stained glass. Large pieces of gold usually look golden and metallic, but when gold gets very small its color can change because it interacts differently with light. The red glass contains gold nanoparticles around 30 nanometers across, while the orange glass contains gold nanoparticles around 90 nanometers across.

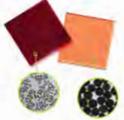


Nano-sized gold and other metals have been used to color stained glass since the Middle Ages. Different materials produce different colors. For example, the yellow-colored stains can come from nano-sized silver particles.

How is this nano?

Medieval stained-glass windows are an early example of nanotechnology. The artists didn't know it at the time, but a material can act differently when it's nanometer-sized. (A nanometer is a billionth of a meter.)

Many nano materials behave differently as they change size. This seems odd because it doesn't happen at the macro-scale. For example, we can't change the flavor of ice cream just by changing the scoop size. No matter what the size, vanilla ice cream always tastes like vanilla ice cream. A big scoop of vanilla ice cream and a small scoop still taste the same. But at the nanoscale, properties can change when the size changes. For example, as particles of gold get smaller, their color changes. This is like the flavor suddenly changing from vanilla to chocolate, just because the scoop got smaller!



Changing the size and shape of gold nanoparticles changes their color

Learning objectives

A material can act differently when it's nanometer-sized.

Materials

- Samples of nanogold stained glass (2)
- Sample of gold flakes
- Precut pieces of clear contact paper
- Small pieces of multicolored tissue paper
- Precut strips of black construction paper
- Scissors
- "Stained-glass Art" image sheet

Gold flakes are available from www.amazon.com.
Stained glass samples made with gold are available from www.bullseyeglass.com (red #001311 and light orange #001823.)

Notes to the presenter

SAFETY NOTE: Take care using scissors with small children.

Before you begin:

- Have small pieces of multicolored tissue paper available.
- Precut the contact paper to the desired size and cut strips of black construction paper for the borders.

Peeling off the backing of the contact paper can be challenging. Sometimes it is hard to get the peel started. One tip before the activity begins, you may want to peel the corner of the backing off some pieces of contact paper to aid visitors who might have difficulty doing it themselves.

Related educational resources

The NISE Network website (www.nisenet.org) contains additional resources to introduce visitors to this topic:

- Public programs include *Nanoparticle Stained Glass*, *Treating Tumors with Gold*.
- NanoDays activities include *Exploring Materials—Nano Gold*.
- Exhibits include *Nano Exhibition*, *Changing Colors*, *Nanomedicine Explorer*, *Treating Disease*, and *Unexpected Properties*.

Credits and rights

This activity was adapted by the Children's Museum of Houston from NISE Network's Exploring Materials—Nano Gold. The original activity is available at: www.nisenet.org.

Image of nano gold particles courtesy of nanoComposix.
Illustration of different colored gold nano particles by Emily Maletz.
Image of stained glass, www.istockphoto.com.
Images of stained-glass art, commons.wikimedia.org.



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Other Materials

- Posters
- Signs
- Videos



Other Programming



THANK YOU!

We couldn't do this without you!





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