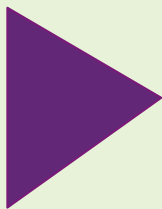


Creating Nano Exhibits and Self-Guided Visitor Experiences





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NISE Network Tools for Creating Your Own Exhibits



Website for educators - nisenet.org

Nanoscale Informal Science Education Network

The NISE Net is a national community of researchers and informal science educators dedicated to fostering public awareness, engagement, and understanding of nanoscale science, engineering, and technology.

Become a partner of the NISE Network. Learn how to **get involved** or **sign up now**.

Catalog

- Exhibits
- Tools and guides
- Media
- Image Gallery

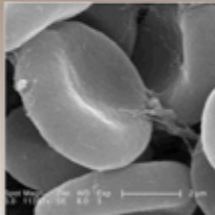
NanoDays
The Biggest Event for the Smallest Scientist!

MARCH 30 - APRIL 7, 2013

The NanoDays 2013 physical kit application is now available - [Apply today!](#)



Image Collection



Human Red Blood Cells (SEM)

Red blood cells carry a protein called hemoglobin which has a molecular structure adapted to transport oxygen to body tissues. This scanning electron micrograph shows the cells' characteristic donut-like shapes.

NISE Net News

[Blog](#) [Newsletter](#)

[Blog](#)

NanoDays 2013 kit applications - due December 1, 2012

By [Catherine McCarthy](#) on September 24, 2012 | [0 comments](#)

Apply now for a NanoDays 2013 physical kit!
[Read more](#)

NanoDays
The Biggest Event for the Smallest Scientist!

[Blog](#)

Annual Partner Survey to launch in late October 2012

By [Catherine McCarthy](#) on September 24, 2012 | [0 comments](#)

We are excited to announce that the NISE Net Annual Partner Survey will be launched in late October!

[Read more](#)



New in the Catalog

[Catalog](#)



Select NISE Network educational products are now available in Spanish!

[Programs](#)

Nano Future Tellers



Nano Future Tellers are origami-folded, interactive pocket game to educate visitors ages 7-12 about future nano products! Everyone's favorite fortune telling game brings potential future nano products to life! [Read more](#)

[Programs](#)

Scientist Speed Dating



Scientist Speed Dating is a facilitated, yet informal and high-energy, social activity to encourage a large group of people to speak with one another, ask questions, and learn about specific areas of research and practice within the field of nanoscale science and engineering, as well as the related societal and ethical implications of work in this field. [Read more](#)

[Tools and Guides](#)

Products in Catalog

NISE NET PRODUCT



NISE Net Products

- Created with NISE Network funding
- Development process:
 - scientist review, peer review, & evaluation
- Standards and templates
- Encourage free sharing and adaption

LINKED RESOURCE ►

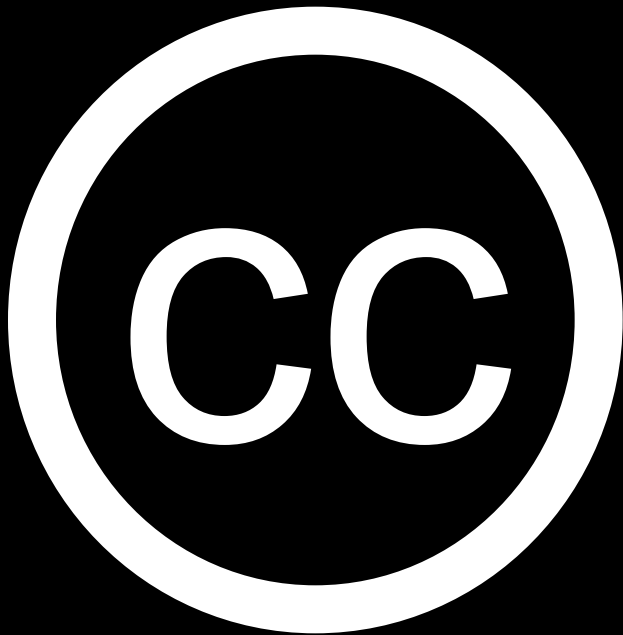
Linked products

- Created with other funding
- Vetting process
- Different rights ownership/attribution

Creative Commons license clarifies use

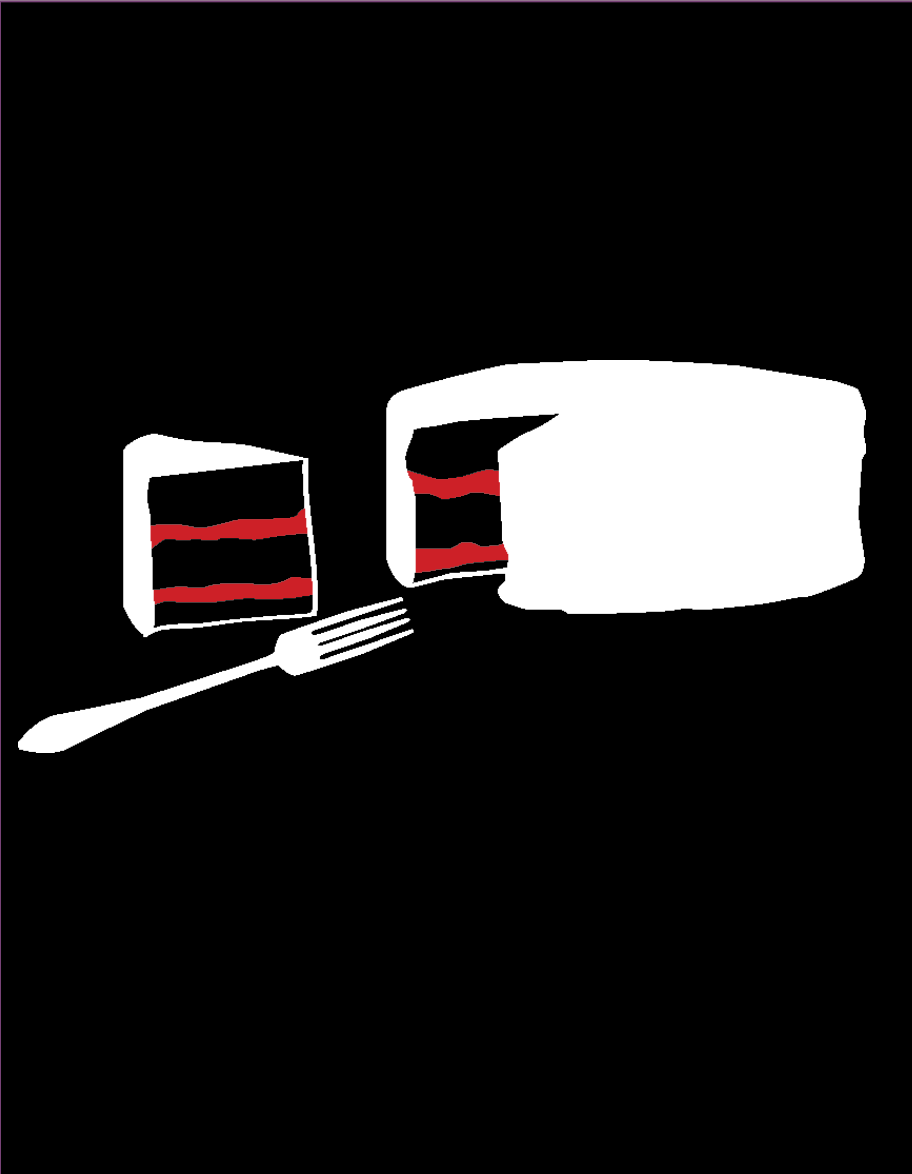


Creative Commons



- Allows a creator to state how they feel about copying and re-use
- Licensing is simple and straightforward process
- Geared towards electronic content

Why do we use Creative Commons?



- Helps build a creative community
- Furthers educational goals
- Allow others to adapt, and build on our work
- Increase access to our work, widespread use

Creator's rights



- Creator still owns the copyright
- Creator allows others to use
- Legal jargon is taken care of

Examples of Licenses

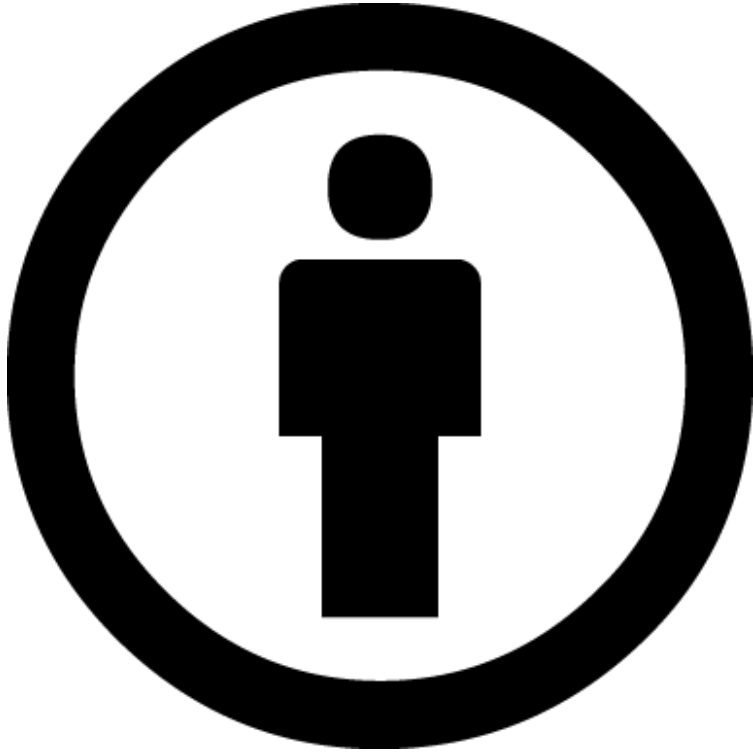


- Creator can choose from a variety of licenses

NISE Network License:

- Attribution
- Non-commercial
- Share Alike
- allows “derivatives”

Attribution icon



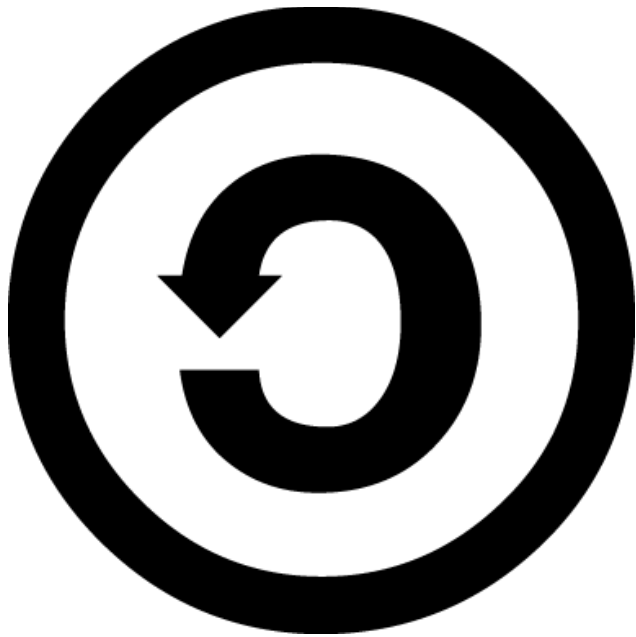
Author must be
acknowledged on all copies
and adaptations of the work

Non-Commercial icon



The work can only be used for non-commercial purposes

Share Alike icon



The work can be modified and adapted, but the entire resulting work (including new material added by the adaptor) must be distributed under the same share alike license

Tools & Guides: Main Messages



Content Map

articulates the key ideas for our educational products



Engaging the Public in Nano

Key Concepts

More info: nisenet.org/catalog

NISE Net Exhibits



**Nano
mini-exhibition**



**Nano Medicine
Explorer Kiosk –
software**



**“Large” Nano
exhibits**

More info: nisenet.org/catalog/exhibits

nano

mini-exhibition



Mini-exhibition host resources:

- promotional materials
- technical manual
- Universal Design guide
- Audience guide
- bilingual materials
- training materials
- Image credits list

Media – videos



Zoom into a Blue Morpho Butterfly video



How Small is Nano



Zoom into a Lotus Leaf video



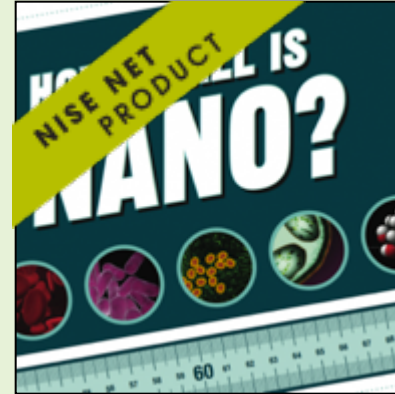
Intro Video

More info: nisenet.org/catalog/media

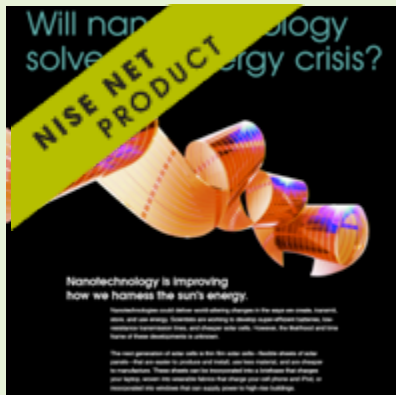
Media – print, signs, posters



Key Concepts
Posters



How Small is Nano
book & poster



Nano & Society
Posters



What's Nano
about... signage

More info: nisenet.org/catalog/media

Image Collection



Nasturtium Leaf:

*Amy Snyder,
Exploratorium*



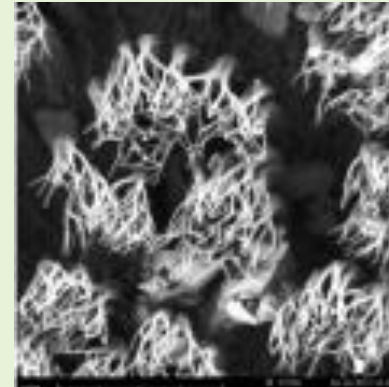
Nasturtium Leaf (2500x)

*Ann Marshall,
Stanford University*



Gecko Foot

*A.Dhinojwala,
University of Akron*



Gecko Foot (8700x)

*Cliff Mathisen, FEI
Company*

More info: nisenet.org/image-collection

Website for the Public

whatisnano.org

English Español

Home | NanoDays | Nano Exhibition

Nano is all around us—
in nature and in technology.

NanoDays
NanoDays is a nationwide festival of educational programs about nanoscale science and engineering and its potential impact on the future.
> Learn more

NanoBuzz
Current nano news:
join the conversation!

- Bio Flash Mob**
Posted May 11, 2012
- Itty-bitty Art**
Posted May 9, 2012
- The Iceman bleedeth**
Posted May 3,

K-12 Teachers
Curriculum and activity resources for K-12 teachers to use in their classrooms.
> Learn more

Resources

- Introductions
- Video
- Audio
- Games
- Products & Society
- DIY Nano

DIY nano
Downloadable from the iTunes store. Free. The DIY Nano app allows families to experience and learn about nanoscale science, engineering, and

Invisible Sunblock
What's in your sunblock? In this activity, kids find out why some mineral sunblock rubs in clear. Suitable for kids ages 5 and up.
edit

Rainbow Film
How can you make rainbow colors out of clear nail polish? In this activity, kids use clear nail polish to create a beautiful iridescent pattern on black paper. Suitable for

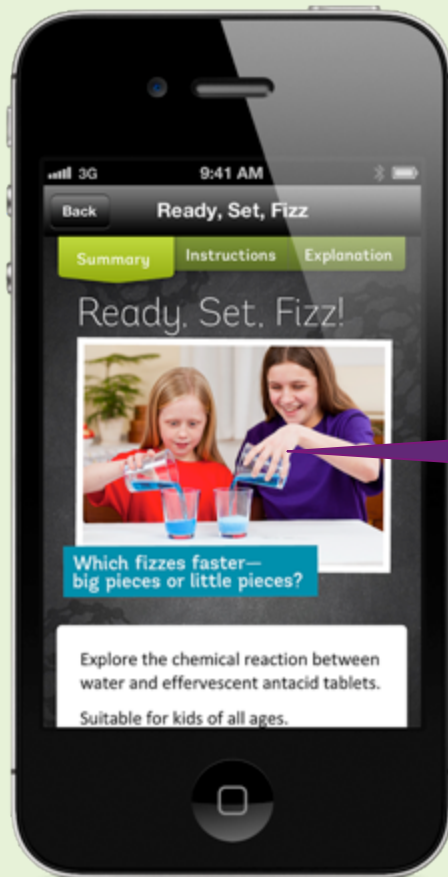
Mystery Sand
Can sand keep itself dry? In this activity, kids play with surprising sand that doesn't get wet! Suitable for kids ages 3 and up.
edit

Mitten Challenge
What's the right tool for the job? In this activity, kids try to put together toy bricks—wearing oven mitts on their hands! Suitable for kids ages 3 and up.

- Videos, podcasts, activities, links
- List of mini-exhibition locations
- Audio Description in English and Spanish

whatisnano.org

DIY Nano App for iPhones



Activities to try at home





This presentation is based on work supported by the National Science Foundation under Grant No. 0940143.

Any opinions, findings, and conclusions or recommendations expressed in this presentation are those of the author(s) and do not necessarily reflect the views of the Foundation.





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Imaginarium Science Center 'Nano Lab'

Sarah Heath

STEM Program Coordinator

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sheath@cityftmyers.com

The Imaginarium Science Center engages guests in the exploration of Science, Technology, Engineering, and Math (STEM) through hands-on exhibit experiences and educational programs that further the understanding of the natural and human-made world, foster an appreciation for Southwest Florida's unique environment, and nurture intellectual curiosity, discovery, and innovation.

Imaginarium Science Center



Imaginarium Science Center



Imaginarium Science Center



Nano Lab

- Before



NISE Net

- Applied for the 2012 NISE Network Mini-Grant
- Great experience with NISE Net in the past
- Applied to create a ‘Nano Lab’ to introduce nanoscale science education to our visitors through hands-on activities both self-serving and facilitated

Imaginarium's Nano Lab!



Nano Lab Activities

- Self facilitated activities
- Always changing!
- Durable



Nano Lab Activities



Nano Lab Activities



Nano Lab Activities



Nano Lab Programming

- Demos







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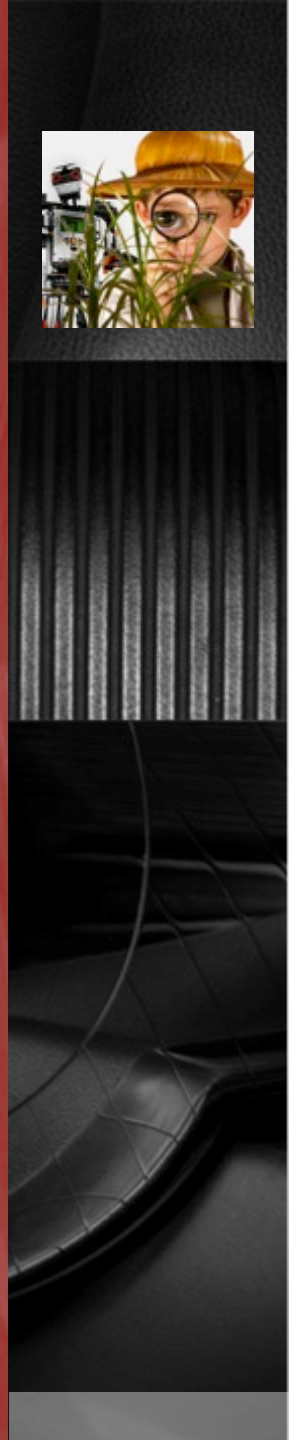
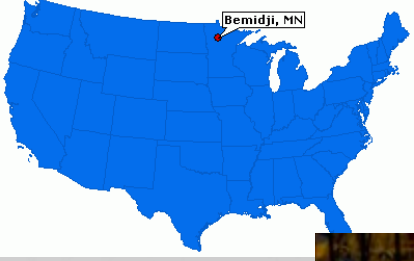
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Headwaters Science Center Bemidji, MN





Guiding Principles

1. Exhibitions should be research-led, not merely a form of dissemination
2. A scientist should always be involved in the exhibition, a technologist if it is about technology
3. Be clear about exhibitions being “multi-authored”
4. Never show ready-made science

Show:

- Science in the making
- Triumphs of discovery
- Frustrations and blind alleys
- Social and cultural processes and implications

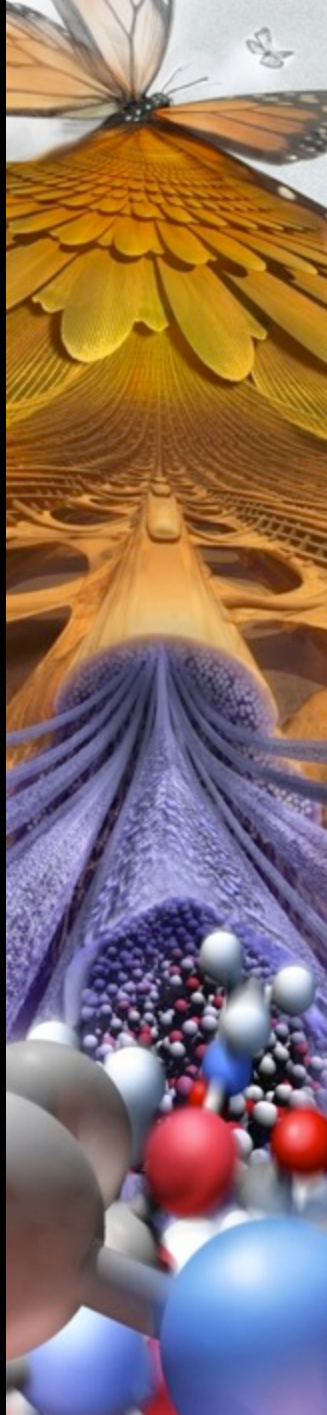
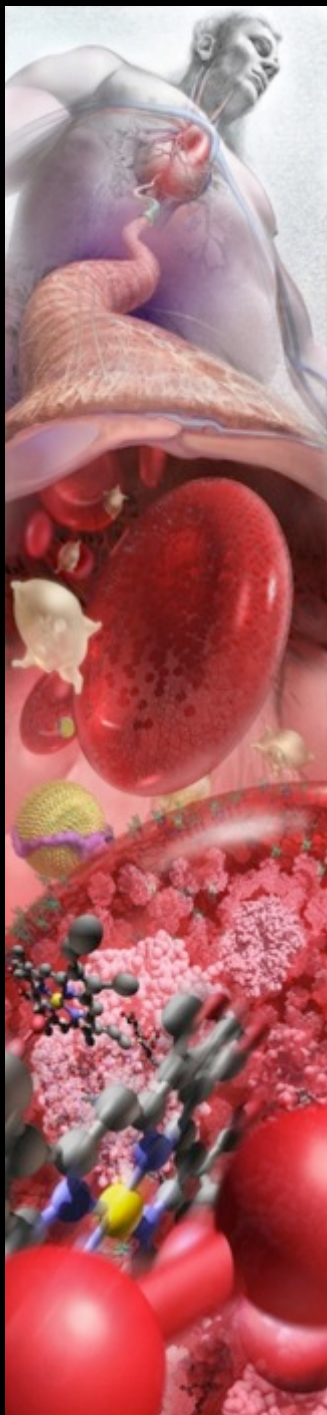
Guiding Principles continued...

5. Jealously guard a place for mystery and wonder
6. Remember that visitors ultimately make their own exhibitions
7. Embrace the “Show-Business” aspect of exhibitions
8. Make exhibitions the jumping off place for further engagement

**Don't be afraid to bend,
break or reinvent the rules !**

Occasionally they:

- Bring in new objects to museums
- Have an impact on recruitment
- Improve the organization's reputation
- Provide a context for corporate celebrations
- Really change visitors' lives



Everything is
made of atoms.





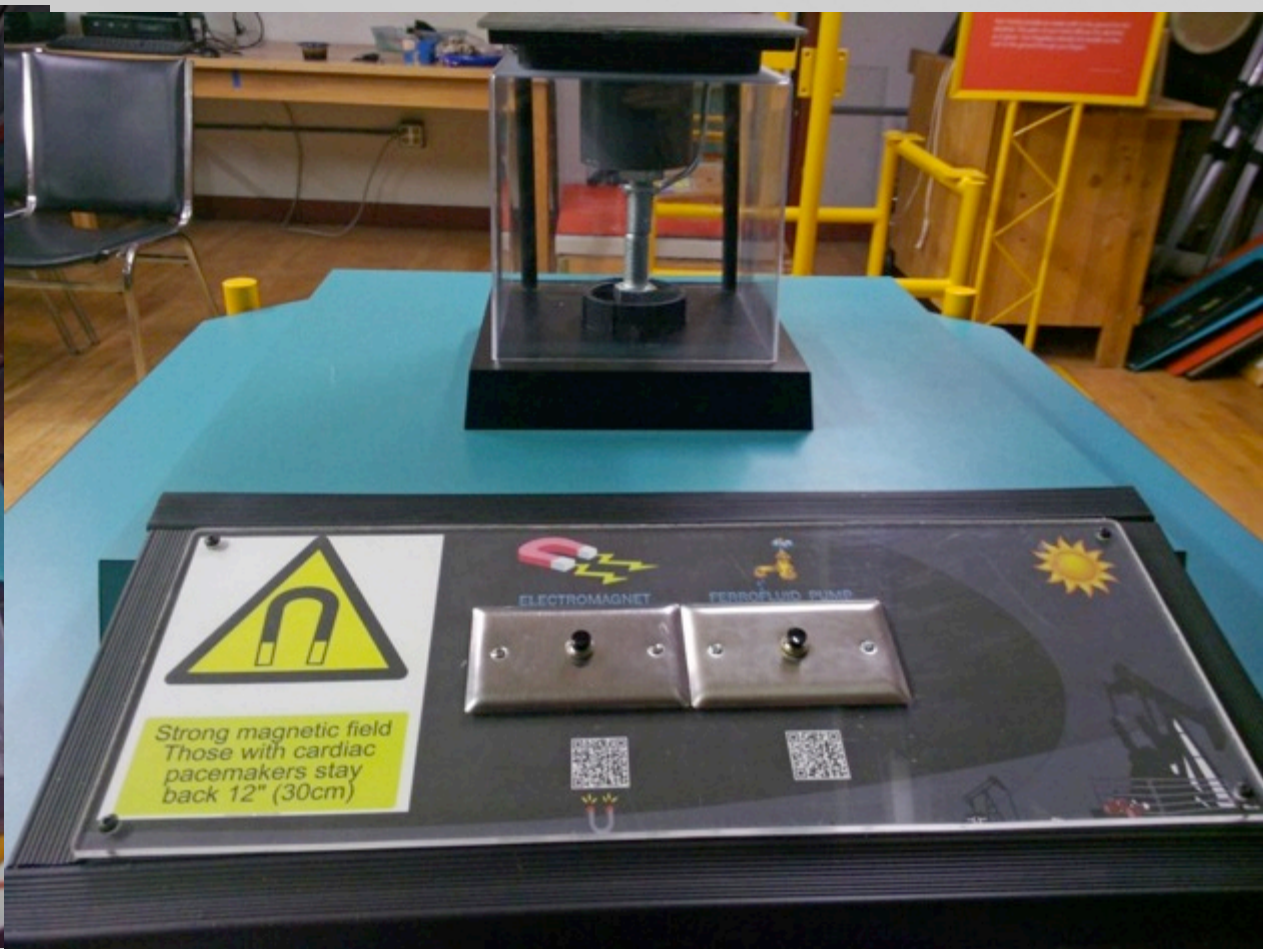







<http://htwins.net/scale2/>





What is Ferrofluid?

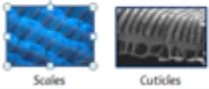
- A magnetic fluid invented by NASA during the 1960's to pump fuel when in outer space
- Comprised by volume
 - 85% carrier oil 
 - 10% surfactant
 - 5% magnetite (nano-sized magnetic solids)
- Surfactants → "Surface active agents"
 - Organic molecules with
 - Hydrophilic (*water-loving*) heads
 - Hydrophobic (*water-repelling, oil-loving*) tails
 - Lower surface tension
 - Assure particles spread

What is going on here?

- A powerful electromagnet initiates a magnetic field through the large steel bolt
- Ferrofluid flows into the varying flux (quantity of magnetism) orienting itself along magnetic field lines
- van der Waal's interactions push and pull at the nanoscale
- Surfactants keep particles from clumping
- Meanwhile gravity drags the shiny colloidal liquid downward



Blue Morpho Butterflies and Nano-Nature



- Blue Morpho's wing color is not mere pigment
- Nano-sized wing structures preferentially reflect certain light measures
- See what happens when you trip the switch and illuminate Morpho from above or below

Liquid Crystals



- Phased between liquid and solid
- Colors are created when nano-sized crystals re-structure
- Micro-encapsulated pigments shift color as temperatures change
- **TOUCH THEM...**





MEDICAL MUSEION

The Culture of Medicine - yesterday, today, tomorrow



A manifesto for creating science, technology and medicine exhibitions

by Thomas Soderqvist





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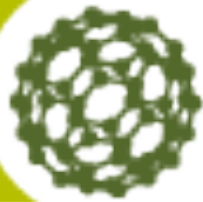
Buffalo Museum of Science





NISE network™

NANOSCALE INFORMAL SCIENCE EDUCATION







HALLWALLS, BUFFALO MUSEUM OF SCIENCE, UB COLLEGE OF ARTS & SCIENCES PRESENT

SCIENCE & ART CABARET No. 3

ILLUMINATING NANO

WEDNESDAY, NOVEMBER 3, 2010, 7 PM IN THE NINTH WARD AT BABEVILLE
ADMISSION IS FREE, CASH BAR

DOUG BORYTAJSKI, Buffalo Museum of Science • READ PRISLE, UB Assistant Professor, Bio-Physics
SAMRAN DAMURTHY GANAPATHY, UB Assistant Professor, Biophysics
MOSIE SHUMAR, Composer • VIRECODE (PETER D'AVIRIA & ANDREA MAROUSO), Visual Artist

THE SCIENCE & ART CABARET IS AN ENTERTAINING MESHUP OF CUTTING EDGE SCIENCE WITH ART, MUSIC, POETRY, AND PERFORMANCE. THIS EVENING, HOW DOES LIGHT INTERACT WITH NANO-SCALE MATERIALS CREATING BEAUTIFUL, STRANGE AND VERY USEFUL EFFECTS? HOW DO NANOTECHNOLOGIES IN PARTNERSHIP WITH ORGANIC MOLECULES BRING PLANTS TO LIFE? IS IT POSSIBLE TO DESIGN THE FUTURE? WHAT IS THE POTENTIAL OF NANO-TECHNOLOGY FOR BIOLOGY AND MEDICINE?





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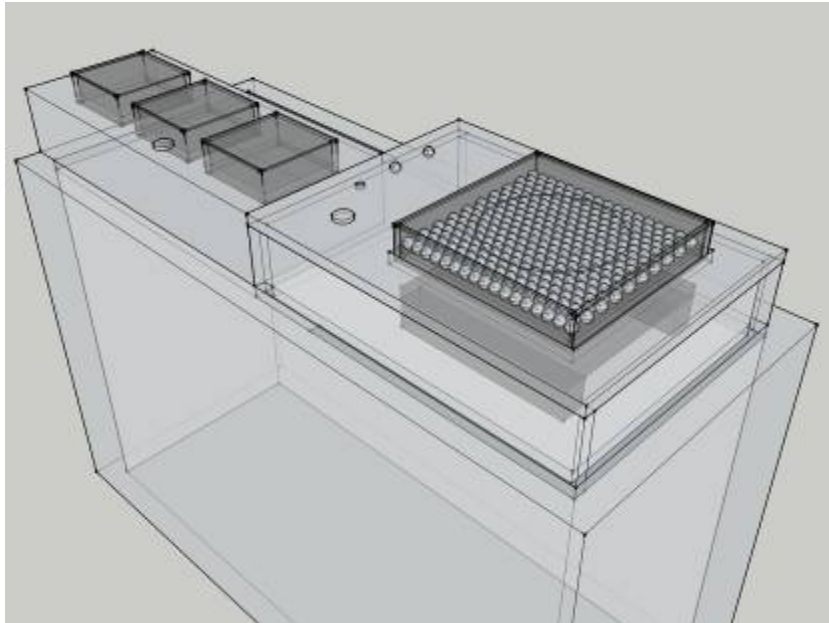
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NISE Network: Saint Louis Science Center Mini- grant Nano Prototype Exhibit







Big Idea:

It is difficult to work with atoms at the nano scale because their behavior is



BUMPY



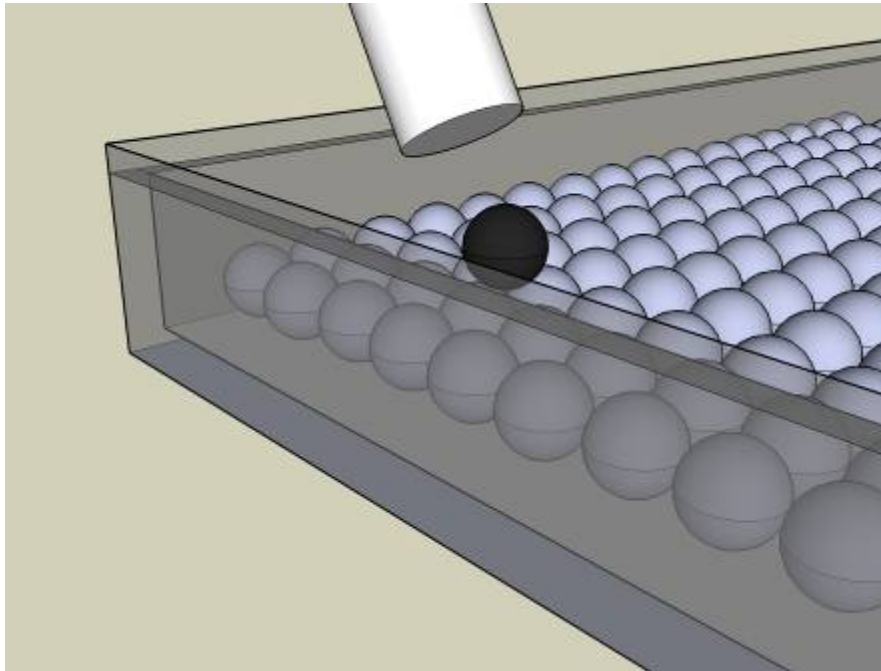
STICKY



SHAKY

Nano Exhibit Prototype 1:

Visitors use a magnetic wand to manipulate vibrating magnetic balls.



Prototype 1: Formative Evaluation Results

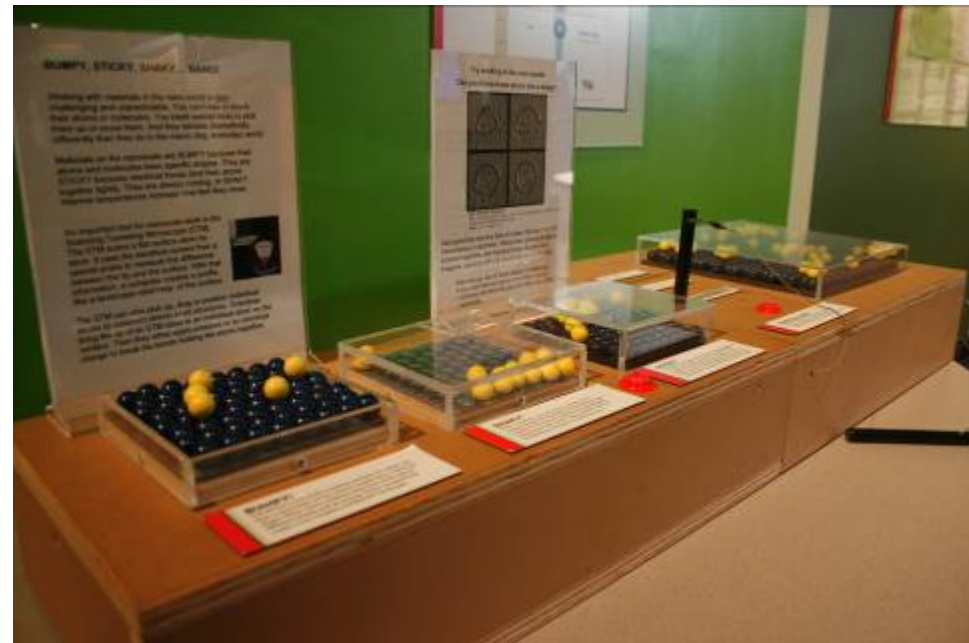
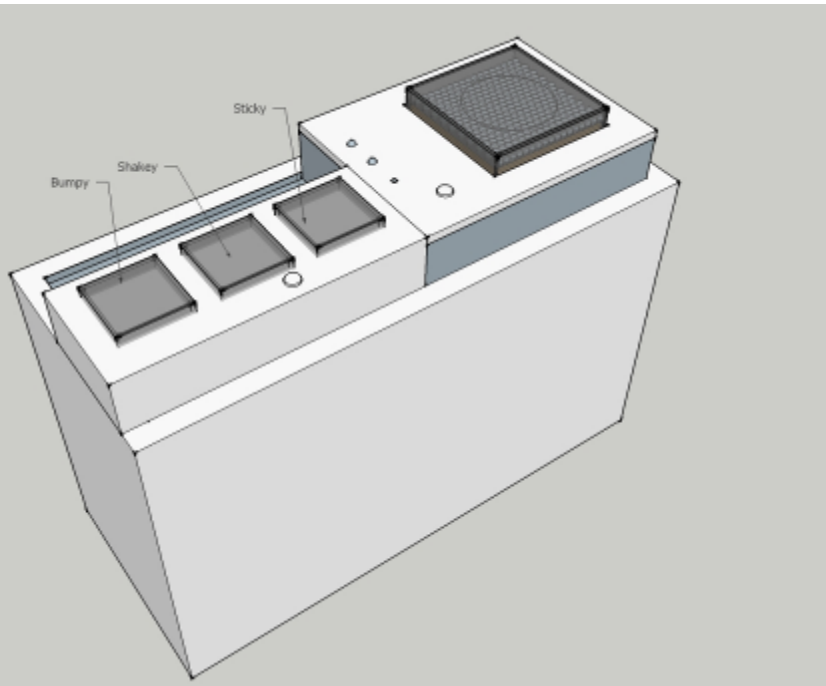
Learning Objective: Visitors will be able to describe that, at the nano scale, it is difficult to work with atoms because their behavior is bumpy, sticky, and shaky.

- **Enjoyment:**
 - Exhibit is engaging
 - Both children and adults enjoyed the activity
- **Learning Objectives:**
 - Visitors thought the exhibit was about magnets/magnetism
 - Concept of bumpy was not apparent to visitors



Nano Exhibit Prototype 2:

Isolating the concepts of Bumpy, Sticky, and Shaky with the “main” interactive.



Prototype 2: Formative Evaluation Results

Learning Objective: Visitors will be able to describe that, at the nano scale, it is difficult to work with atoms because their behavior is bumpy, sticky, and shaky.

- **Enjoyment:**
 - Almost all visitors enjoyed their experience
- **Learning Objectives:**
 - 55% of visitors explained the exhibit was about atoms/nanoparticles
 - 65% of visitors communicated one of the learning objective components
 - 3% of visitors thought it was about magnetism



Final Nano Exhibit Prototype



Nano Exhibit Development Lesson Learned

- Let the Big Idea and the Learning Objectives be your guide
- Formative Evaluation is invaluable
- Use Iterative Prototyping: Keep refining until learning objectives are met



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“The Palouse Discovery Science Center is bringing hands-on science and learning experiences to people of all ages.”

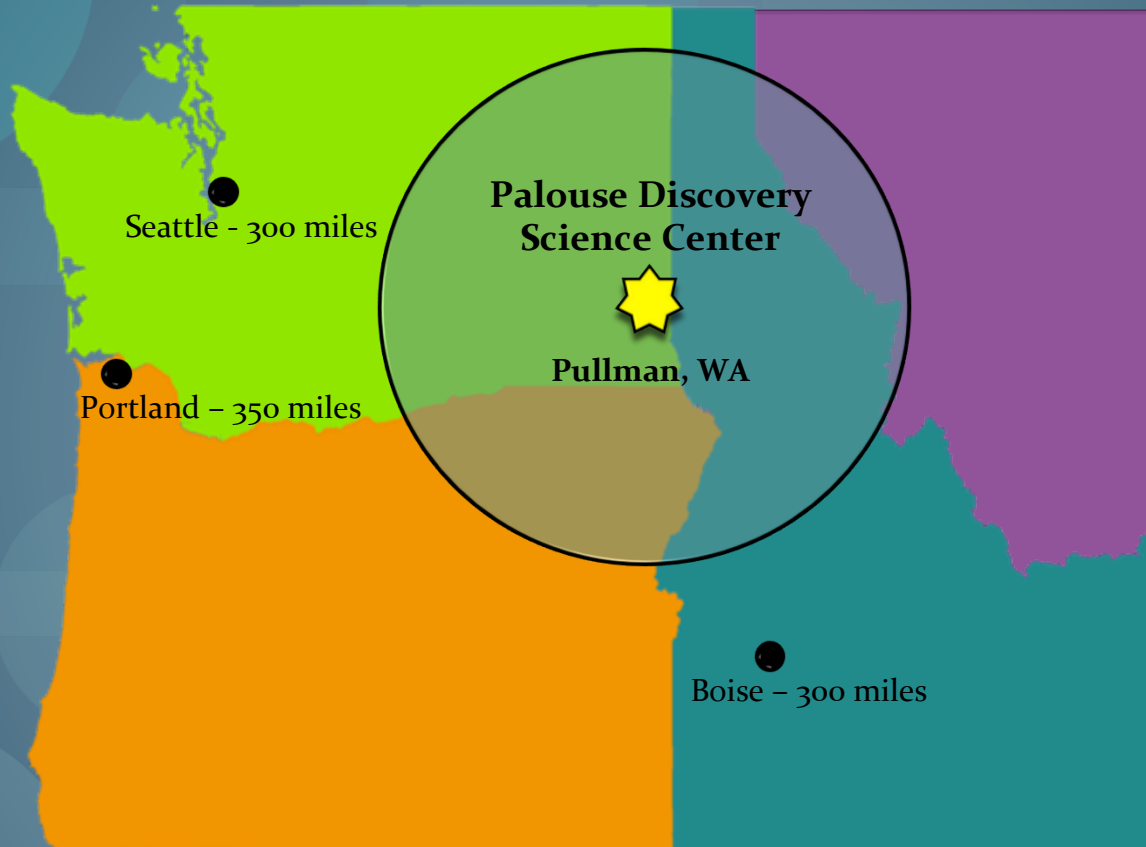
-from the PDSC Mission Statement

palouse discovery science center



Victoria Scalise
Executive Director
Palouse Discovery Science Center
Pullman, WA

Service Region



Located in the rural region of Eastern Washington and Northern Idaho, the Palouse Discovery Science Center serves a 4,720 sq. mile region.

Science on the Palouse



The Palouse Discovery Science Center offers a wide variety of engaging science education opportunities ranging from single day workshops to week long camps and interactive exhibits. All events are open to the public and are free with admission.

Bringing Science Education to All

Located in rural Eastern Washington, the PDSC strives to make science education affordable and accessible to all children, through fun, hands-on outreach events, birthday parties, community fairs, and special in-house events.



Nano Technology at the Center



Nano Self-Service Lab



Nano Events



Every year the Palouse Discovery Science Center hosts a variety of nano themed events including NanoDays and Nano Open House.

New Nano Exhibit



Publicity

Palouse Discovery Science Center

Open House!

Friday

September 21, 2012

NEW!

Featuring:

Nano Exhibit



FREE
Admission

"Telescopes and
The Moon"

Open House 5pm-8pm
Formal Nano Exhibit Introduction 5pm
"Telescopes and The Moon" 7pm-8pm



For more information contact us at:
(509) 332-6869
950 NE Nelson Ct.
Pullman, WA 99163
www.palousecience.org



NanoDays™

The Biggest Event for the Smallest Science!

Join the *Palouse Discovery Science Center* for an interactive exploration of Nanotechnology. We will be learning about **Graphene** and *Ferrofluid*, the nano properties of **sunblock** and **butterfly wings**, identifying nano images and more!



Saturday, March 24th
10am - 2:30pm
Palouse Discovery
Science Center

Admission is FREE to PDSC members, \$5/child, \$7.50/adult for non-members



For more information contact us at:
(509) 332-6869
950 NE Nelson Ct.
Pullman, WA 99163
www.palousecience.org





This presentation is based on work supported by the National Science Foundation under Grant No. 0940143.

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Questions and Discussion?

