



# Exhibit Small Talk – Tips for Hosting *Nano*: Training Staff

*Featuring...*

**Christina Akers**, Exhibit Developer & MW Regional Hub Leader for NISE Net at SMM

**Margaret Hennessey Springe**, Director of Education at the Kansas Children's Discovery Center

**Bethany Thomas**, Education Coordinator at the Children's Discovery Museum

**Kathy Fournier**, Vice President of Education at the McWane Science Center



# **Avoid reinventing the Wheel!**

## **There's a NISE Net product for that!**



**[nisenet.org/catalog/exhibits/nano\\_mini-exhibition](http://nisenet.org/catalog/exhibits/nano_mini-exhibition)**

**[whatisnano.org](http://whatisnano.org) [whatisnano.org/nano-exhibit](http://whatisnano.org/nano-exhibit)**

Links to:

- Exhibition info & resources for download
  - Video walk-thru & photos
- Audio Description & Bilingual Resources
  - Selected books about nano
- Intro to Nano – Reference Articles
- Evaluation guidelines & templates
- Training videos & orientation materials

# 1. Nano is small and different



**What happens when things get smaller?**

**smaller?**

**What happens when things get smaller?**

**Materials can act differently when they're nano-sized.**

For example, tiny particles of gold look red and purple—not the golden metal we're used to. And when nanoparticles of iron are suspended in liquid, they create a remarkable material called ferrofluid, a liquid that's attracted to magnets!

There are other surprises at the nanoscale, too. Different physical forces dominate, making things behave in unexpected ways. For example, when things are nano-sized, gravity is barely noticeable and static electricity has a much greater effect.

Scientists are learning how to take advantage of these special nano properties to create new materials and technologies.

**¿Qué sucede cuando las cosas se hacen más pequeñas?**

**Los materiales pueden actuar de manera diferente cuando son de tamaño nanométrico.**

Por ejemplo, diminutas partículas de oro se ven rojas y moradas, no el metal de oro que estamos acostumbrados. Cuando las nano partículas de hierro suspendidas en líquido, crean un material extraordinario llamado ferrofluido, un líquido que atrajo a los imanes!

Hay otras sorpresas en la escala nano, también. Diferentes fuerzas físicas dominan, haciendo que las cosas se comporten de maneras inesperadas. Por ejemplo, cuando las cosas son de tamaño nanométrico, la gravedad es casi imperceptible y la electricidad estática tiene un efecto mucho mayor.

Los científicos están aprendiendo cómo aprovechar estas propiedades nano especial para crear nuevos materiales y tecnologías.



# 2. Nano is studying & making tiny things

What's  
**new**  
about nano?

**What's new about nano?**

Nanotechnology lets us build things the way nature does—atom by atom.

Try "building blocks" called atoms make up everything in the world. To make different materials, atoms combine in different ways. Diamond, graphite, and carbon nanotubes are all made entirely from carbon. They're different because their carbon atoms are arranged differently.

In the field of nanotechnology, we're learning to build useful things out of individual atoms. Some new nanomaterials even assemble themselves!

**¿Qué hay de nuevo nano?**

Pequeños bloques de construcción llamados átomos forman todo en el mundo. Para hacer de diferentes materiales, los átomos se combinan de diferentes maneras. Los nanotubos de diamante, grafito y carbono son todos hechos enteramente de carbono. Son diferentes porque sus átomos de carbono están dispuestos de manera diferente.

En el campo de la nanotecnología, estamos aprendiendo a construir cosas útiles de los átomos individuales a cabo. Algunos materiales de nano nuevo, incluso se ensamblan!





# 3. Nano is new technologies

Where can you  
**find nano?**



# 4. Nano is part of our society & our future



**What does nano mean for us?**

**What does nano mean for us?**  
Nanotechnology will affect our economy, environment, and personal lives.

Some scientists think that new nanotechnologies could transform our lives just as much as the automobile or personal computer!

As individuals and communities, we'll need to balance the costs, risks, and benefits of nanotechnologies. By deciding whether to use products containing nanomaterials and technologies, you help shape nano research and development. Companies and governments also shape our nano future, by deciding which technologies to invest in and how to regulate them.

How can we prepare for a future that includes nano?

**¿Qué significa la nano para nosotros?**  
La nanotecnología afectará a nuestra economía, el medio ambiente, y su vida personal.

Algunos científicos piensan que las nuevas tecnologías nano podría transformar nuestras vidas tanto como el automóvil o computadores personal!

Como individuos y comunidades, tendremos que equilibrar los costos, riesgos y beneficios de las nanotecnologías. Al decidir si se debe usar productos que contengan nanomateriales y las tecnologías, que ayudan a la investigación forma nano y el desarrollo. Las empresas y los gobiernos también dan forma a nuestro futuro nano, al decidir que para invertir en tecnologías y cómo regularlos.

¿Cómo podemos prepararnos para un futuro que incluye nano?





# Training Materials:

## *Nano 101, How to/not to*



**Nano 101 for staff**  
(2012 version)



**America's Next Top Presenter** (video)



**NanoDays training materials**  
for staff and volunteers



**Speed-ucate or How to have an effective science and society conversation** (video)

**See more online at: [nisenet.org](http://nisenet.org)**

# **Training Materials:**

## *Nano & Society, Learning Standards*



**Nano and Society  
Training Materials**  
for staff &  
volunteers



**Visitor  
Conversations**  
goals and tips



**Improv  
Exercises**  
for staff and  
volunteers



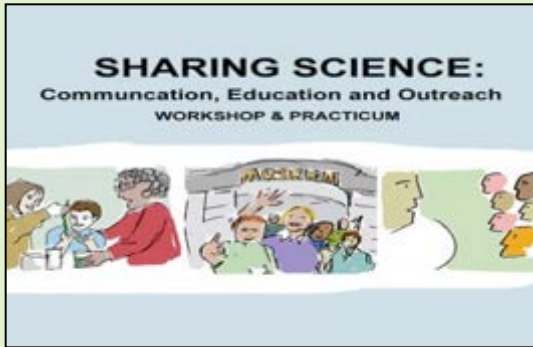
**Learning  
Framework**

***See more online at: [nisenet.org](http://nisenet.org)***

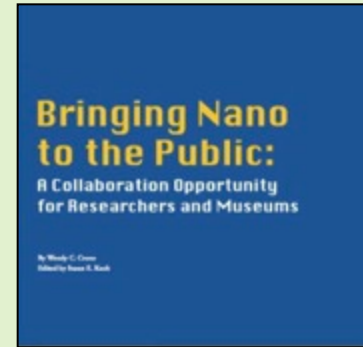


# **Training Materials:**

## *Museums and Research Centers Unite!*



**Sharing Science Graduate Workshop and Practicum**  
for graduate students



**Bringing Nano to the Public: A Collaboration Opportunity for Researchers and Museums**



**REU (Research Experiences for Undergraduates) science communication workshops**



**RISE Partner Guide: Small Steps; Big Impact** for museums, how to start a collaboration with researchers

# Where in the world is...

# nano





# Where in the world is...

# nano





***Save Qs for the end,  
or type in them in  
the chat box now!***



# Kansas Children's Discovery Center

Margaret Hennessey Springe

Director of Education

[mspringe@kansasdiscovery.org](mailto:mspringe@kansasdiscovery.org)



July 2014 - Nano mini-exhibition staff training



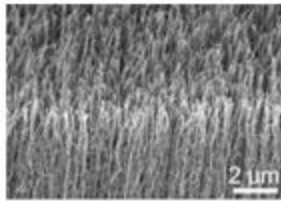


# Training Objectives

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- Provide understanding of nanotechnology to our staff, volunteers and board members.
- Arm our staff with vocabulary that is easy to use and understand.
- Provide opportunities to investigate the NISE kits and have an opportunity to practice with others.

## CHANGING THE DOMINATE FORCES OF A SYSTEM



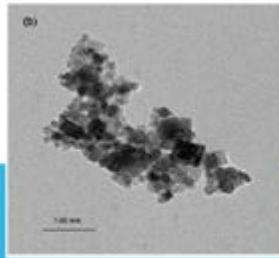
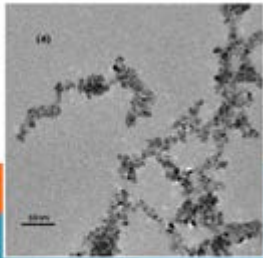
Liangti Qu, 2008

Researchers at Georgia Tech created a dry adhesive tape using carbon nanotube to mimic a gecko's foot



## CHANGING PHYSICAL PROPERTIES

- Titanium dioxide is a physical sunscreen.
- In nanoparticle form it is transparent.



Rajeev Wahi, 2006, Rice University





# Lessons Learned

Pick the right partner to develop the workshop.



# Lessons Learned

- Allow enough time for participants to work in-depth with kits.
- Make it fun!





***Save Qs for the  
end, or type in  
them in the chat  
box now!***

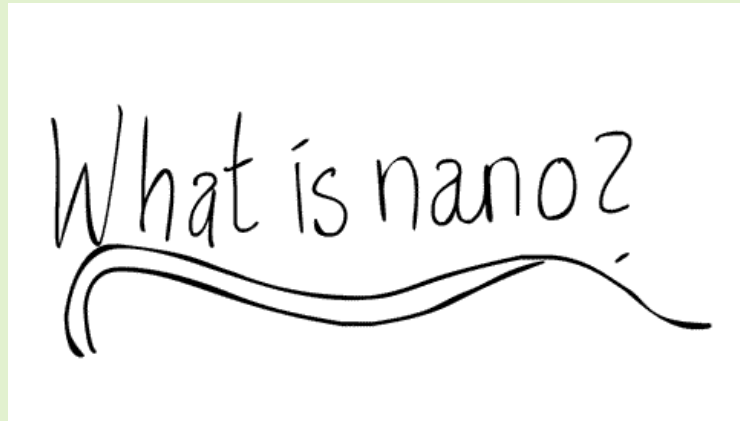


# Children's Discovery Museum

## Bethany Thomas



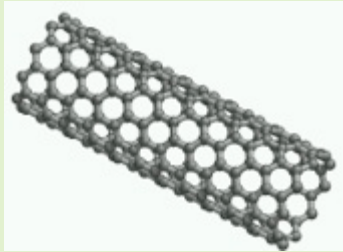
# Nano Mini-Exhibit Training



## **Two main questions we wanted to answer:**

1. How knowledgeable staff/volunteers are about nanotechnology?
2. How comfortable staff/volunteers are talking to visitors about nanotechnology?

# Nano Mini-Exhibit Training



## Staff Training:

- Held on two separate days:
- Wednesday from 5:30-7:30; Friday from 12:30-2:30 & 2:30-4:30
- Provided pizza dinner
- PT staff paid for training

## Outline of Training:

- Meet/Greet/Food/Pre-Survey
- Background on our partnership with NISENet
- Goals for the training
  - Increase your knowledge on Nano Technology, specifically related to topics covered in nano exhibit
  - Increase your confidence talking to visitors about Nano topics
- Explanation of Activities covered in exhibit
  - Carbon Nanotube
  - Blue Morpho Butterfly
  - FerroFluid
  - Static Electricity
  - Tips for Engaging visitors
  - Activity Stations – teaching practice
- Post survey
- Questions/Debrief



# Nano Training– Powerpoint

## TRAINING GOALS

- Increase your knowledge of Nano Technology
  - Scale – Macro, Micro, Nano
  - Behavior of things on the molecular level
  - Real world application
  - New technology design
- Increase your confidence talking to visitors about Nano Topics
  - Approaching visitors
  - Continuing conversation
  - Informing visitors

# Nano Training– Powerpoint

## STATIC ELECTRICITY-SIZE MATTERS

- Pg. 6
- By adding electrons to the tubes you add static electricity
- Large balls
  - More mass per ball
  - Lower surface area to volume ratio
- Small balls
  - Less mass per ball
  - Higher surface area to volume ratio



## FERRO FLUID-SIZE MATTERS

- Pg. 16
- Ferro Fluid is a Paramagnet
  - a solid in the presence of a magnet
  - a liquid when magnet is removed
- This is due to nano particles of magnetite
- It is used on printed money, in computer hard drives and speakers to dampen vibrations



# Nano Training - Powerpoint

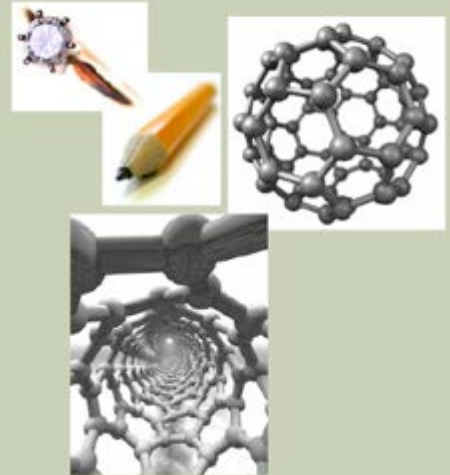
## BLUE MORPHO BUTTERFLIES- SHAPE MATTERS, PG. 18



Video from NISENet website

## CARBON NANOTUBES – SHAPE MATTERS

- Pg. 14
- Carbon behaves differently based on its structure at the nanoscale
  - Diamonds
  - Graphite
- Carbon also forms 2 useful nanosized structures
  - Bucky Balls
  - Carbon Nanotubes





# Nano Training - Powerpoint

## YOU ARE THE TEACHER

- Small Groups
- 7 min at each activity station
- Teach the content to your peers
- One instructor at each station, switch instructor at new activity
- Other partners are “visitors”
- Ask hard questions
- Help each other learn the content and be comfortable with not knowing the answer!
- Have fun!!!

# Nano Training - Powerpoint

## QUESTIONS

- Do you have any questions?
- Our questions for you...
  - How did you like this training?
  - How was the pace of the training?
  - Would it be better to have training in stages throughout the summer?  
Basic over view, then more detail later?
  - What could we do to improve this training for you?
  - Would you find trainings like this useful for other CDM exhibits, new or current? If so, which ones?

# Nano Training – Tips for Engagement

**Greet visitors** - Say “hello,” make eye contact, and smile. Simply looking like you’re available and friendly will bring visitors to the station and will invite them to interact with you. If it people are not coming to the station you can feel free to go out and invite them to come and experience the activity with you.

**Let visitors do the activity** - As much as possible, let visitors do the hands-on parts of the activity, and let them discover what happens. (If your activity has a surprise, don’t give it away!)

**Let the visitors do the talking** - As much as possible, let visitors’ interests guide the conversation. You can help them reflect on their own ideas and form their own opinions. If visitors aren’t interested in an extended conversation, that’s fine.

**Share what you know** - Use clear, simple language. Focus on one main idea – don’t feel that you need to tell visitors everything at once! Keep the information basic for starters, and be willing to expand on an idea for interested learners.

**Keep the conversation open-ended** - In a conversation about individual values and perspectives, there’s no right and wrong answer. Your contributions can provide interesting things to think about, but shouldn’t suggest a conclusion.



# Nano Training – Tips for Engagement

**Use examples from everyday life** - Familiar examples can help explain abstract concepts. Be aware of visitors' abilities, keeping in mind that children do not have the same skills or vocabulary as adults.

## **Ask Questions**

Help visitors observe and think about the activity. Try to use questions that have more than one answer, such as:

What do you see happening?

Why do you think that happened?

What surprised you about what you saw?

Does this remind you of anything you've seen before?

**Be a good listener** - Be interested in what visitors tell you, and let their curiosity and responses drive your conversation forward.

## **Offer positive and encouraging responses**

When visitors are having trouble articulating their thoughts, you might say, "That's an interesting idea. Why do you think that?" or "Have you thought about...?" Offer them an opportunity to reflect further. If visitors haven't quite grasped a concept, you might say, "That's a good guess," or "Very close, does anyone else have something to add?" Don't say, "No" or "Wrong" in response to visitors' observations or explanations.

# Nano Training – Tips for Engagement

**Share accurate information** - You can provide additional information or a different perspective, but maintain a neutral position on issues. If you aren't sure about something, it's OK to say, "I don't know. That's a great question!" Suggest that visitors go to [whatisnano.org](http://whatisnano.org), our museum website or our facebook page to learn more about nano scale science, engineering, and technology and what will be offered in the future at the museum.

**Remain positive throughout the interaction** - Keep things upbeat and positive. Remember nonverbal communication is important, too. Maintain an inviting face and body language.

**Thank visitors** - Wrap up the conversation whenever it has run its course. A brief interaction is fine!! As your interaction ends, suggest that they explore other activities.

**HAVE FUN!** A positive experience will lead to learning.

# Nano Training – Staff Pre Survey

## Nano Exhibit Training Pre Survey

1. How interested are you in nanotechnology?

Very

Somewhat

Undecided

Not really

Not at all

2. How knowledgeable do you feel about things being on the macro, micro and nano scale (what a nanometer is)?

Very

Somewhat

Undecided

Not really

Not at all

3. How knowledgeable do you feel about how things behave differently on the nano scale, on the molecular level?

Very

Somewhat

Undecided

Not really

Not at all

4. How knowledgeable do you feel about nano technology and where/how we use it in our daily lives?

Very

Somewhat

Undecided

Not really

Not at all

5. How knowledgeable do you feel about nano technology and how it is used in new technology development?

Very

Somewhat

Undecided

Not really

Not at all

6. How comfortable are you with talking to visitors about nano technology and all its aspects?

Very

Somewhat

Undecided

Not really

Not at all

# Nano Training – Staff Post Survey

## Nano Exhibit Training Post Survey

1. How interested are you in nanotechnology?

Very

Somewhat

Undecided

Not really

Not at all

2. How knowledgeable do you feel about things being on the macro, micro and nano scale (what a nanometer is)?

Very

Somewhat

Undecided

Not really

Not at all

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Very

Somewhat

Undecided

Not really

Not at all

6. How comfortable are you with talking to visitors about nano technology and all its aspects?

Very

Somewhat

Undecided

Not really

Not at all

7. Did you want to know more about specific topics in nanotechnology?

Very

Somewhat

Undecided

Not really

Not at all

If so which one and why?

8. We wish to improve these trainings. What could we have done better?



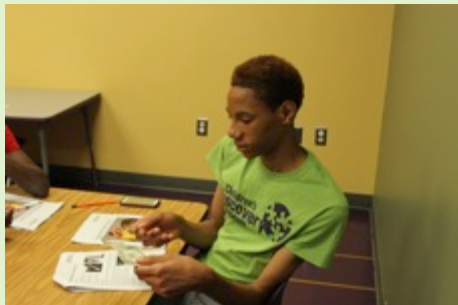
# Nano Training - Reflection

## Positive Reflection



- Overall, staff and volunteers found the training very useful
- Staff and volunteers felt more knowledgeable and confident on subject matter
- Staff and volunteers enjoyed playing with activities
- Found format and length of time appropriate
- Liked the idea of cheat sheets to have on floor
- Food a bonus!

## Improvements



- Suggested playing with activities immediately after introduction
- Demonstrate the activity, then allow staff and volunteers to ask questions while fresh in their heads and they can hear everyone's questions
- Training when exhibit is installed so staff and volunteers can take a tour

# Nano Training – Cheat Sheets



## Cheat Sheets for floor staff and volunteers

- Simplified main exhibit concepts into three statements:
  - Nano is very, very small
  - Things on the nanoscale behave and react differently
  - New technologies
- Highlighted four main areas of the exhibit: Morpho butterfly, ferro fluid, static electricity and nano tubes
  - Keep content simple
  - Make science/nano connection
  - Real world connections/examples

# Nano Training



For more information or questions contact:  
Bethany Thomas, Education Coordinator at [bthomas@normal.org](mailto:bthomas@normal.org)  
or Rachel Carpenter, Innovation Station Supervisor at  
[rcarpenter@normal.org](mailto:rcarpenter@normal.org)

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# McWane Science Center

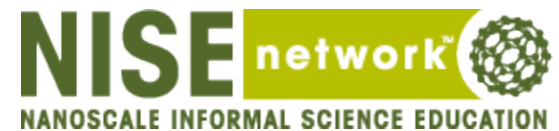
Birmingham, Alabama



NISEnet Brown Bag  
July 24<sup>th</sup>, 2014  
Nano Mini Exhibit  
*Staff Training*

Kathy Fournier  
Vice President of Education  
205-714-8254  
[kfournier@mcwane.org](mailto:kfournier@mcwane.org)

# Partners



# Goals for Project

1. to provide training in science communication, exhibit interpretation and inquiry based science methods to students enrolled in the Science and Technology Honors Program (STHP) at UAB;
2. to provide more meaningful field trip experiences for middle school students living in the Black Belt Region of Alabama; by increasing awareness of the science and applications related to nanoscience
3. utilize the expertise of local scientists to enhance the visitor experience within the Nano exhibit
4. to strengthen relationships with partnering institutions

*UAB students will be stationed within our Nano Exhibit to coincide with the arrival of our target audience; middle school students from the Black Belt Region of Alabama. These field trips will occur between January and May 2013.*

Workshop # 1 Sharing Science (January 2013)

Workshop #2 Inquiry Based Teaching Techniques and Universal Design (February 2013)

Workshop # 3 Nanotechnology: It's Applications and Impact on Society (February 2013)

Workshop #4 Exhibit Interpretation Training (January-March 2013)







# Successes, Challenges and Unexpected Outcomes

## Successes

....met 3 out of 4 goals

## Challenges

Scheduling

.....busy undergrad students

.....coordinating students schedules with actual field trips

....busy McWane Staff (especially March-May)

## Unexpected Outcomes

Data Collected for STHP class requirement and Professional Poster



# ***NanoDays: Training College Students to Relay Nanotechnology Information to Science Museum Guests***

Jasmine L. Howard and Maurice Asouzu

Prime Time Leadership, Dr. Diane Tucker

Honors Academy, University of Alabama at Birmingham, Birmingham. AL 35294

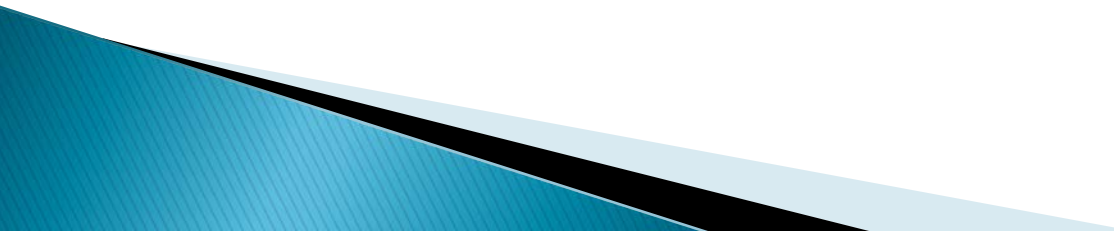
## **Surveys**

- 40 surveys given to science center guests regarding their learning experience and overall effectiveness of students in conveying scientific information to guests

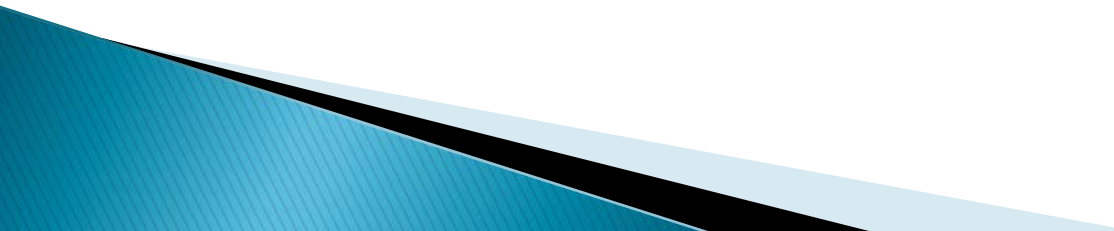
## **Results**

- Majority (more than 50 percent) of the survey participants had not heard about nanotechnology prior to visit.
- Participants indicated that they benefited from the presentations and now have a better understanding of nanotechnology.
- Majority of the guests agreed that the student guide was knowledgeable and engaging.

## **Conclusion**

- Overall, this was a successful service project that effectively combined education and science to ignite a passion and interest in museum guests.
- 

# FINAL THOUGHTS

- ▶ Don't re-invent the wheel
  - ▶ Collaboration is easy....sort of
  - ▶ Be ready for unexpected outcomes and challenges
  - ▶ Ask for help or ideas
- 

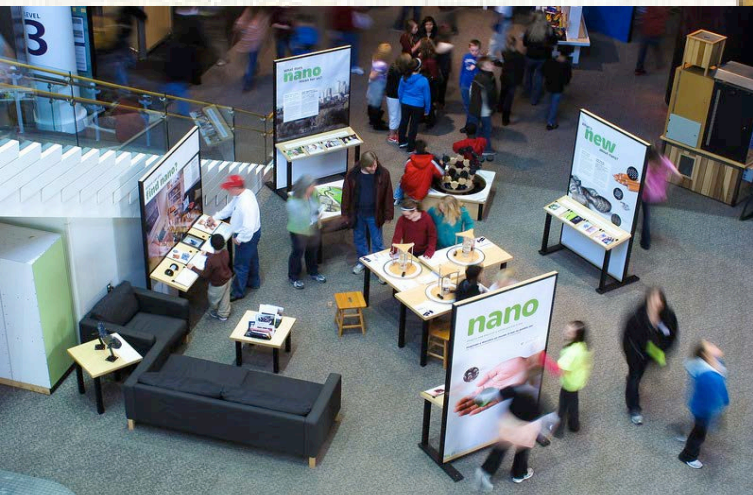
# Thank You!



Kathy Fournier  
Vice President of Education  
205-714-8254  
[kfournier@mcwane.org](mailto:kfournier@mcwane.org)



Type ALL Qs  
in chat box  
now!



# Questions and Discussion



**Poll: What mini-exhibition  
topics do you want us to cover?**

# THANK YOU!

For more info on the mini-exhibition,  
mini-grants, and ***most*** all things *mini*:

**cakers@smm.org**



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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.