

Welcome!



Reaching Rural Audiences with Nano Content

- Tim Hecox, Oregon Museum of Science & Industry (OMSI)
- Jessie Herbert, SpectrUM Discovery Area
- 'Āhia Dye, 'Imiloa Astronomy Center
- Dawn Kirchner, Boonshoft Museum of Discovery
- Julie Bryan, Children's Discovery Museum of West Virginia

Ice Breaker

Look up and Scream!

Players stand in a circle. Everyone looks down at their shoes. All look up at the same time, each looking intentionally at a particular person. If you make eye contact with the person you're looking at, you both scream and leave the circle. Repeat until 1 or 2 people are remaining.

More Improv Exercises at:

http://www.nisenet.com/catalog/tools_guides/improv_exercises

Tim was once an Outreach Educator and developed a class on nano...



You can find it on www.omsi.edu

NANO: THE SCIENCE OF SMALL

LOCATION

At Your
School/Location

FORMAT

Classes

TOPIC(S) COVERED

Chemistry,
Engineering,
Physics

GRADE LEVEL(S)

4th — 12th

DURATION

1 hr

COST

\$145 Per Session

In this class, students go beyond microscopic, observing firsthand the strange, sometimes surprising properties of matter when manipulated at the nanoscale.



[LEARN MORE](#)

OMSI

Today's Hours: 9:30am - 5:30pm
Location (map): 1945 St. Walker Ave.
Language: English
Tickets: +

OMSI FOR Everyone | Kids | Educators | Professionals

SHOWS OFFERINGS | REGISTER | OVERVIEW | WHY OMSI?

LET OMSI COME TO YOU
OMSI Traveling Programs for All Ages

[LEARN MORE](#)

The screenshot shows the OMSI website interface. At the top, there's a navigation bar with the OMSI logo and links for 'Today's Hours', 'Location (map)', 'Language', and 'Tickets'. Below this is a horizontal menu with four icons: a flask for 'SHOWS OFFERINGS', a pencil for 'REGISTER', a briefcase for 'OVERVIEW', and a question mark for 'WHY OMSI?'. The main content area features a large photograph of a female teacher in a green shirt standing and interacting with a group of diverse students sitting on the floor in a classroom. Overlaid on the photo is the text 'LET OMSI COME TO YOU' and 'OMSI Traveling Programs for All Ages'. A green 'LEARN MORE' button is positioned below the text.

And on www.nisenet.org!

Choose filters to narrow your search.

[Product Table of Contents](#)[Nano Throughout the Year!](#)[Spanish Language Translations](#)

Share



Nano Science & Engineering Outreach Education Classroom Program



Description:

This hour long classroom program introduces nano science and nanotechnology as a leading, cutting edge science with an emphasis on nano in nature, health, energy and the environment. The class includes a PowerPoint presentation, three minute video, nine self-guided activities set up as “stations” around the classroom along with a concluding, teacher facilitated class discussion. This program was created for the Oregon Museum of Science and Industry’s (OMSI) Outreach Unit. It has been designed for 4th – 8th graders and travels to elementary and middle schools in seven states around the Pacific Northwest.

Product category:

K-12 Lesson Plans
Programs and Activities

Audience:

Ages 11 - Adult
K-12 Educators

Nano topics:

Art and nature | Bio and medicine | Energy and environment | Fundamentals | Information Technology | Materials, tools, and applications | Society, policy, and economics

Table-top exhibits as part of the class



Soon to be posted on
www.nisenet.org and production
available through OMSI



Nano in Rural Outreach Jessie Herbert



Mission

Inspiring **All Montanans** to pursue higher education, and possibly careers in science, technology, engineering, and mathematics, with the end goal of closing traditional opportunity and achievement gaps

UNIVERSITY OF MONTANA
spectrUM

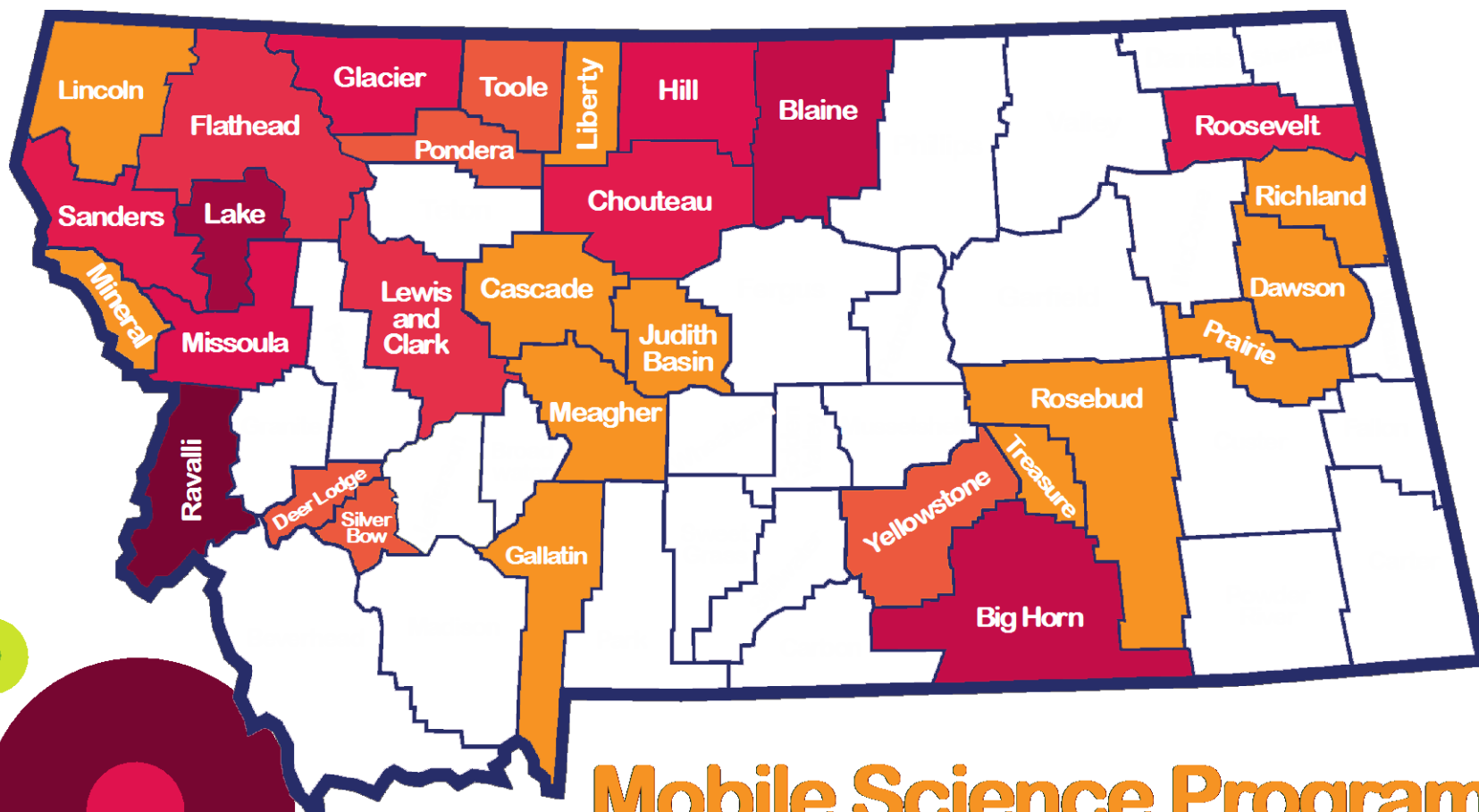




Montana spectrUM Science Experience (MosSE)



UNIVERSITY OF MONTANA
spectrUM



Mobile Science Program Statewide Impact

Inspiring Montana students about science
and higher education one county at a time

Travel in UHauls

Over **31,000** miles!
Served **50,000** kids



UNIVERSITY OF MONTANA
spectrUM

Mobile Science Program

- **Field Trips**
 - 1-3 days
- **Family Science Night**
 - For the whole community

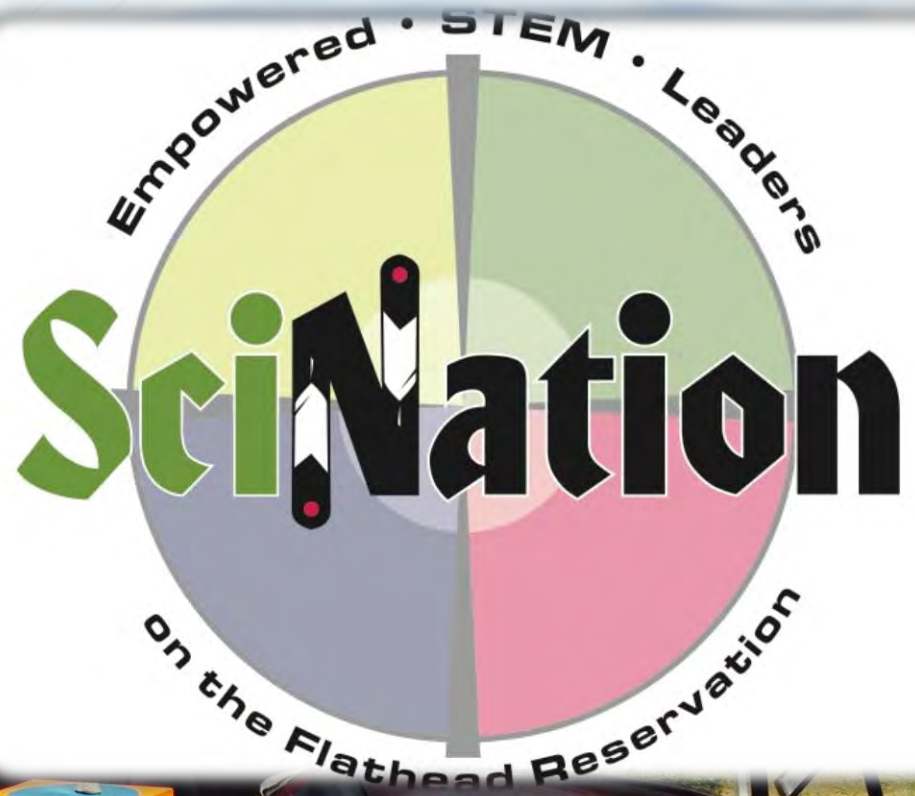


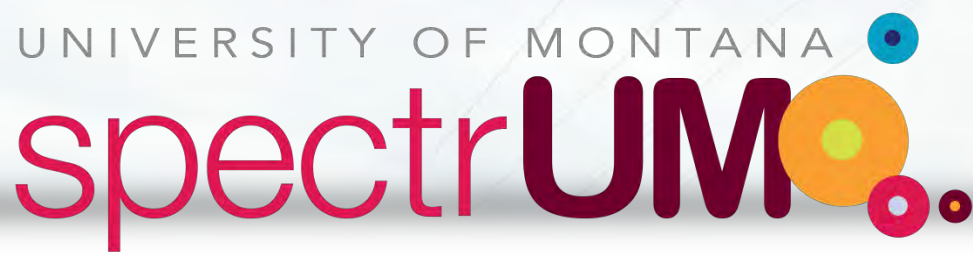
Nano is now mobile!



SciNation

- Partnered with nearby Flathead Reservation
- Give the keys to the community!





Science at the Arlee Celebration



Funding Sources



- Sloan Foundation
- Science Festival Alliance
- NSF EPSCoR
- Montana Cancer Institute
- Noyce Foundation
- Simon's Foundation



What We Did At the Powwow

- Three Daily Themes
 - Health Sciences
 - Ecosystem Sciences
 - Engineering and Technology
- One Astronomy Night



What we continue to do

- Monthly meetings
- Science Bytes
- Mobile Science program during school year
- Summer Camps
- Arlee and Elmo powwow



Role Models

- Local Role Models
- High School Students
- Interns
- Faculty and Staff from UM and Salish Kootenai College



Arlee Celebration





Jessie Herbert

STEM Education Program Manager

jessie.herbert@umontana.edu

Blog

www.spectrummosse.wordpress.com

Localizing Nano for Hawai'i Island



Presentation Overview:

- I. Group Reflection
- II. Background Information
 - The Controversy
 - Hawaiian Pedagogy
 - A Vision of 'Imiloa
- III. NISENET and the NanoKits
- IV. Future Endeavors

Pleuromamma from our Hawaiian Oceans, this small planktonic crustacean is one of the major links of the marine food web. Their antennae are adorned with hairs or "setae" which detect fluid movements and odors. The long antennae also have muscles to stroke in a spectacularly fast escape. Image by *Tina "MicroAngela" (Weatherby) Carvalho, M.S.*, at the Biological Electron Microscope Facility (BEMF) at the University of Hawai'i at Manoa's Pacific Biosciences Research Center (PBRC).

A Quick Reflection...



What are some of your greatest personal accomplishments?

Who has supported you to get to this point in your life?

Where do you pull strength from?

Image: Spider Web Silk Spinnerets fingerlike spinnerets on spiders' posterior abdomens (rear-ends) are used to extrude web silk. This silk is used to weave webs, snares, shelters, and/or egg sacs. This picture was taken by a fourth grade class. Taken by *Tina "MicroAngela" (Weatherby) Carvalho, M.S.*, at the Biological Electron Microscope Facility (BEMF) at the University of Hawai'i at Manoa's Pacific Biosciences Research Center (PBRC).

Background Information



The Controversy that Birthed 'Imiloa Astronomy Center of Hawai'i

Maunakea and an Ahu (honoring shrine) erected in the late 1990s, facing Mauna Kea, on Saddle road between Maunakea and Maunaloa (2007). Photo: Siowl (CC-BY-SA-3.0)

Background Information



The Controversy that Birthed ‘Imiloa Astronomy Center of Hawai‘i

Thirty Meter Telescope (TMT) Construction Crews Blockaded by
“TMT Protestors” on the Mauna Kea Access Road, March 30, 2015.
Photo taken by Kerri Marks. Source: Big Island News Now.

Background Information



The Controversy that Birthed 'Imiloa Astronomy Center of Hawai'i

"Maunakea Protectors" Protecting Sacred Ancestral Land at the building site for the Thirty Meter Telescope on Maunakea. Photo: AP

Hawaiian Pedagogy



Piko Petroglyph Representing An Ancestor-Progeny Relationship
Traditional Petroglyph carved long ago at Pu'uloa, Kilauea, now the Volcanoes National Park, Hawai 'i Island. Photos © Henry Lawrence.

More information is available at:

<http://www2.hawaii.edu/~pesaconf/zpdfs/13kimura.pdf>



Piko 'Ī

or pre-eminent, as the piko at the crown of the head, for Spirituality

Piko 'Ō

at the belly-button piko, for linking to genealogy and creation not of one's own doing

Piko 'Ā

the piko of the genital area, for works of one's own in living life in the world of mankind

Building upon Native Relationships to Land

“Research has documented how development of expertise can begin in childhood through informal interactions with family members, media sources and unique educational experiences. In fact, from early childhood onward, humans develop intuitive ideas about the world, bringing prior knowledge to nearly all learning endeavors.”

- *Surrounded by Science*, National Research Council

How does the controversy impact science learning?

What are the societal impacts of the controversy?



Localizing NanoKits



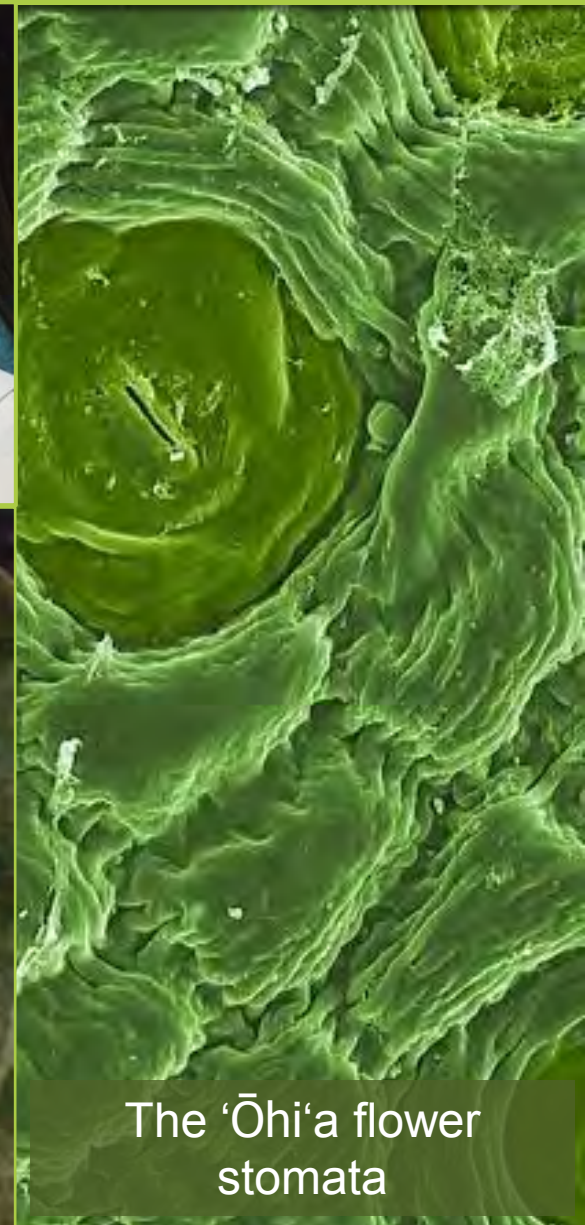
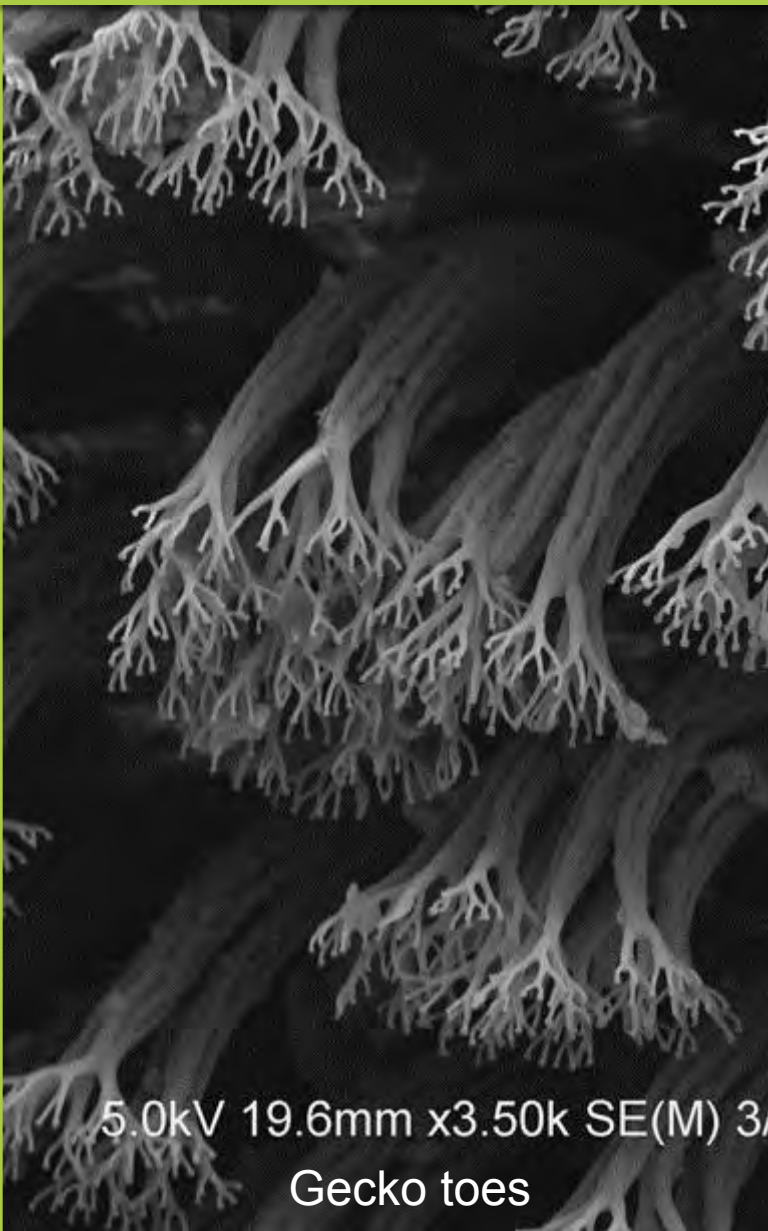
Nu'ukia 'Imiloa - 'Imiloa's Mission

To honor Maunakea by sharing Hawaiian culture and science to inspire exploration.

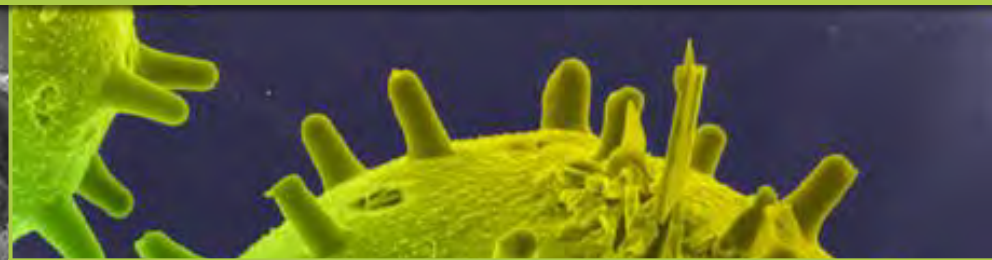
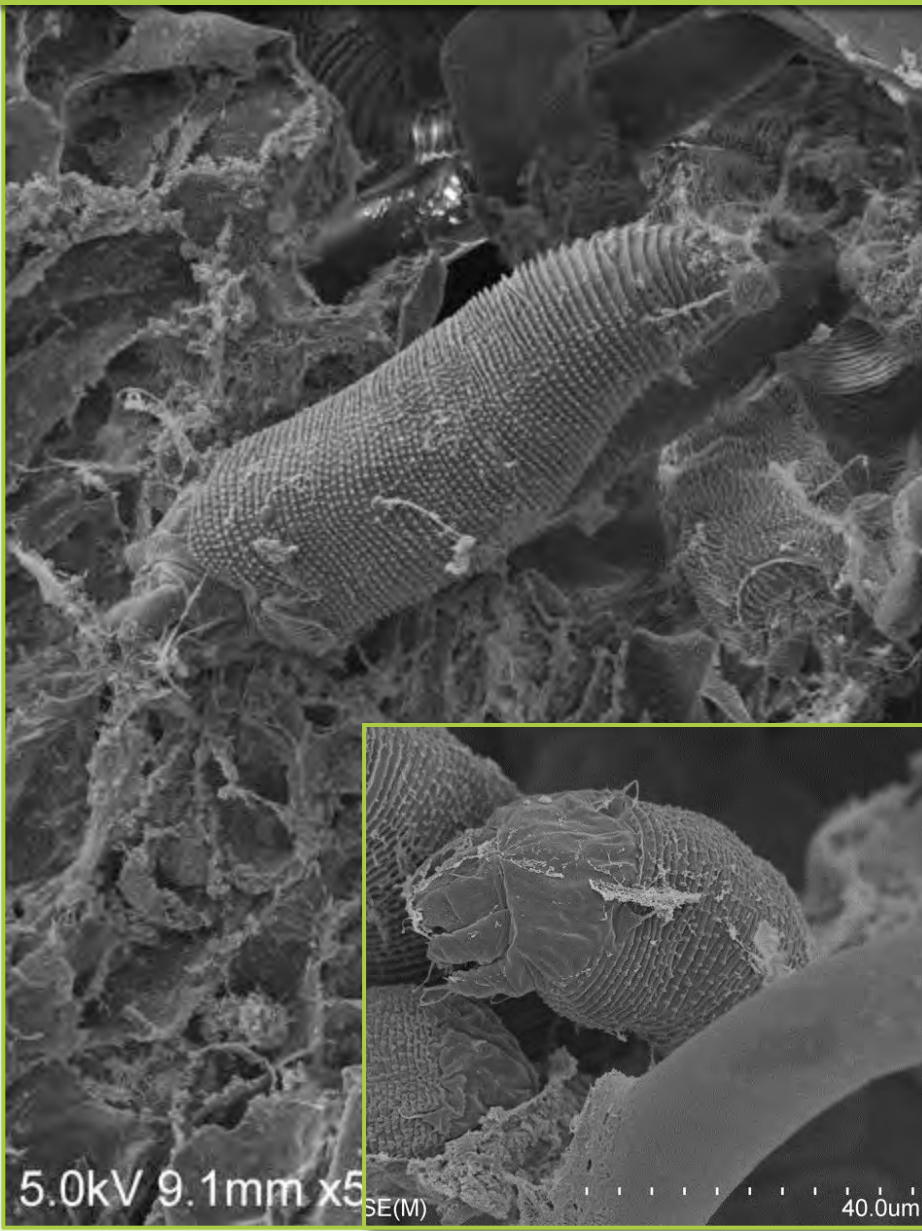
Vision Statement

'Imiloa is a place of life long learning, where the power of Hawai'i's cultural traditions, it's legacy of exploration, and the wonder of astronomy come together to provide inspiration and hope for generations.

Rooted in the Host Culture



Troubleshooting Local Issues

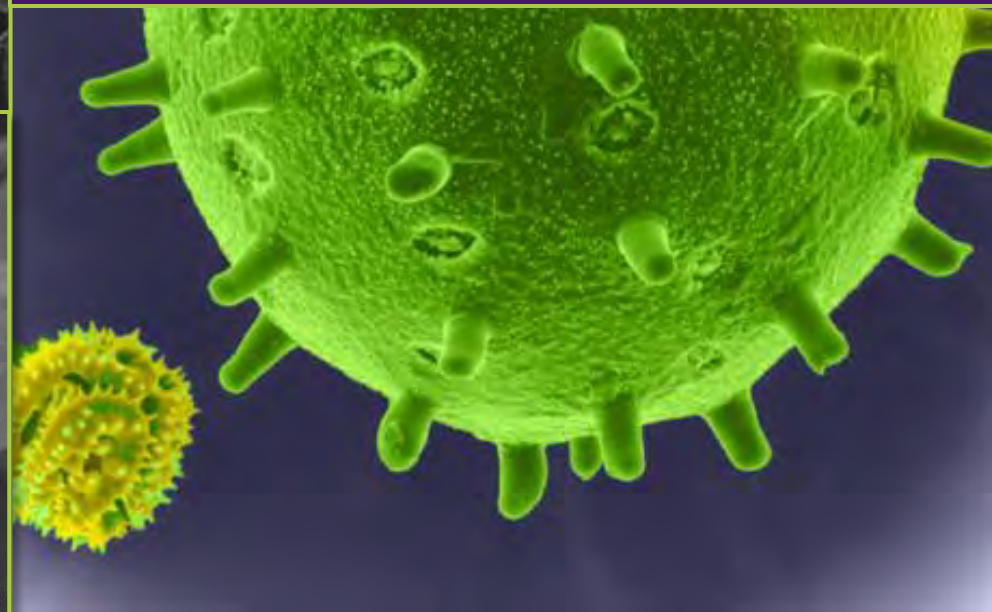


Pū'ali ka hau nui, i ka hau 'iki.

Even the largest branches of the hibiscus can be cinched by it's smallest branches.

Small things affect larger things.

‘Ōlelo No‘eau/Traditional Hawaiian Saying



A Vision for the Future

‘Ahu kupanaha ‘o Hawai‘i ‘imi loa

Innovation & Resourcefulness illuminate Hawai‘i’s wondrous treasures

- Kepelino, 18 Century Hawaiian Scholar



Boonshoft Museum of Discovery

Dayton, OH



Family Science Center
AZA Accredited Zoo
Planetarium

Nano Science 101

2013 Mini grant recipient

- Assembly style program
- Rural communities
- Grades 4 to 6
- Introduction to size and scale
 - What is nano?
 - Why is it important?
 - Does it really matter?

Teacher Requests

Individual class programs

- Assembly format modified
- More student attention
- Emphasis on current class topics



More hands-on vs. demonstration

- Demonstration as introduction

**Meaningful exposure to scientific process and tools
not readily available**

Activities

- Team challenge
- Introduction to surface area
- Chemical reactions – effervescent tablets
- Nano silver – modified wood blocks and Velcro
- Sodium polyacrylate – particle size



Where is it now?

- New name: Nanotechnology
- Exhibits-to-Go
- On-site field trips
 - Grant funded opportunities
- Distance Learning
- Adult workshop

Children's Discovery Museum of West Virginia



Located in
Morgantown

College town of
29,660 (students add
several thousand
more)

Much of WV is rural

3rd poorest state





Children's Discovery Museum of West Virginia

Children's Discovery Museum of West Virginia
Explore, Discover, Grow!



We are a small museum, very small

- 3200 square feet
- Budget of about \$50,000
- Staffing
 - One full time, one part time, one per program

On-site programs



Homeschool Program

Field trips

Saturday Science

NanoDays!

Science Day

Ramps: a wild onion that tastes like a mix of a garlic and onion. They're pungent, to say the very least.



Off-site programs



School outreach

After school-Boys and Girls Club

Science at the Library (new 2015)

Science Night

STEM Nights

Pepperoni roll: a snack popular in WV and some nearby regions of the Appalachian Mountains. It is ubiquitous in West Virginia, particularly in convenience stores, and is arguably the food most closely associated with the state.



NISE Network kits-no modifications



STEM Nights

NanoDays!

Science Day

Science Night

- Make a polymer (gummy capsules)
- Kinetic sand
- Capillary action
- Invisibility
- Ferrofluid (add magnets)
- Dress up in clean room suit
- Thin films
- Memory Metal

NISE Network kits-modified to 20-30 minute program



After-school outreach & Saturday Science

- Gummy capsules
- Capillary action
- Invisibility
- Nano sand
- Electroplating/thin films
- Ferrofluid

Yes, it's real!



NISE Network kits-modified to 60 minute program



Field trips, Classroom outreach,
Science at the Library,
Homeschool Program

- What is nanoscience?
- Make a polymer
- Mars Rover and Memory Metal

Yes, it is this beautiful!



Nano mini-grant



Poorest county in WV

Science kits

What is nanoscience?

Ferrofluid/magnets

Share kits

Too far

Science night

Distance

Evening events don't work

Take me home...



Thank you!



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 authors and do not necessarily reflect the views of the Foundation.



Questions & Discussion



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