



Nanotechnology Demos and Simulations

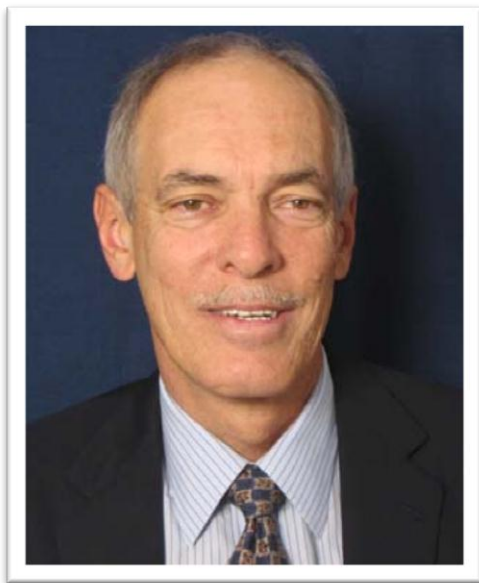
February 22, 2013

The NACK Network was established at the Pennsylvania State College of Engineering, and is funded in part by a grant from the National Science Foundation.



Welcome to NACK's Webinar

Presenter



Michael Lesiecki

Director of the Maricopa Advanced Technology Education Center (MATEC) at the Maricopa Community Colleges

To engage today's learners we need to:

- Present content and information in different ways
- Provide multiple means of engagement
- Universal Design for Learning:
<http://www.cast.org/udl/>

Universal Design for Learning

Recognition Networks

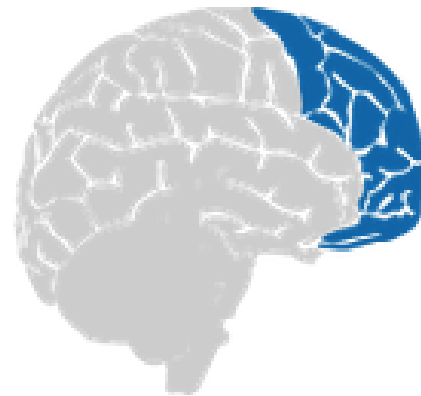
The "what" of learning



How we gather facts and categorize what we see, hear, and read. Identifying letters, words, or an author's style are recognition tasks.

Strategic Networks

The "how" of learning



Planning and performing tasks. How we organize and express our ideas. Writing an essay or solving a math problem are strategic tasks.

Affective Networks

The "why" of learning



How learners get engaged and stay motivated. How they are challenged, excited, or interested. These are affective dimensions.

Objective

- Help students grasp concepts in nanotechnology through multimedia:
 - Animations
 - Interactives
 - Video
 - Simulations/emulations
- And, how do we blend these in?

Rationale for Use

- Complexity
 - Hard to visualize, analyze or explain
- Variable
 - If a system is variable with respect to time or process
- Interdependency
 - Multiple inter-dependent variables

And sometimes...


You just want to show something
in a different way



Multimedia Possibilities

- Show:
 - Animations
 - Interactives
 - Video
- Do:
 - Simple simulations
 - Complex simulations and emulations

<http://nano4me.live.subhub.com/categories/multimedia>

 *Brought to you by the Nanotechnology Applications Center*

Access NACK Resources | Nano4me.org | Login

You Are Here: [Home](#) » [Multimedia](#)

Multimedia

A collection of interactive multimedia in nanotechnology. These resources are available for use in the classroom.

NACK Animations

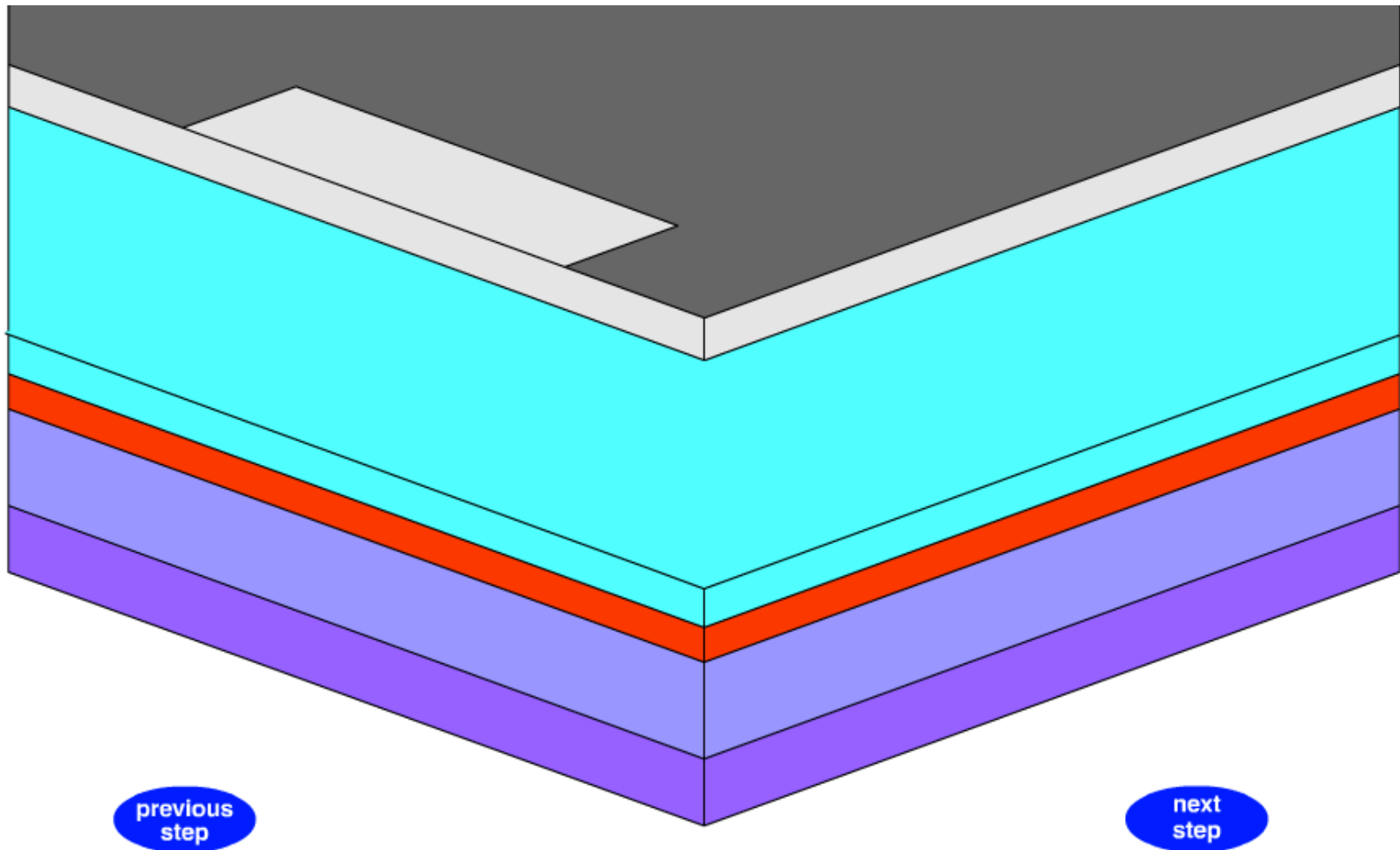
Other Resource Center Nanotechnology Animations

[MATEC NetWorks](#)

Animations: www.matec.org/animations

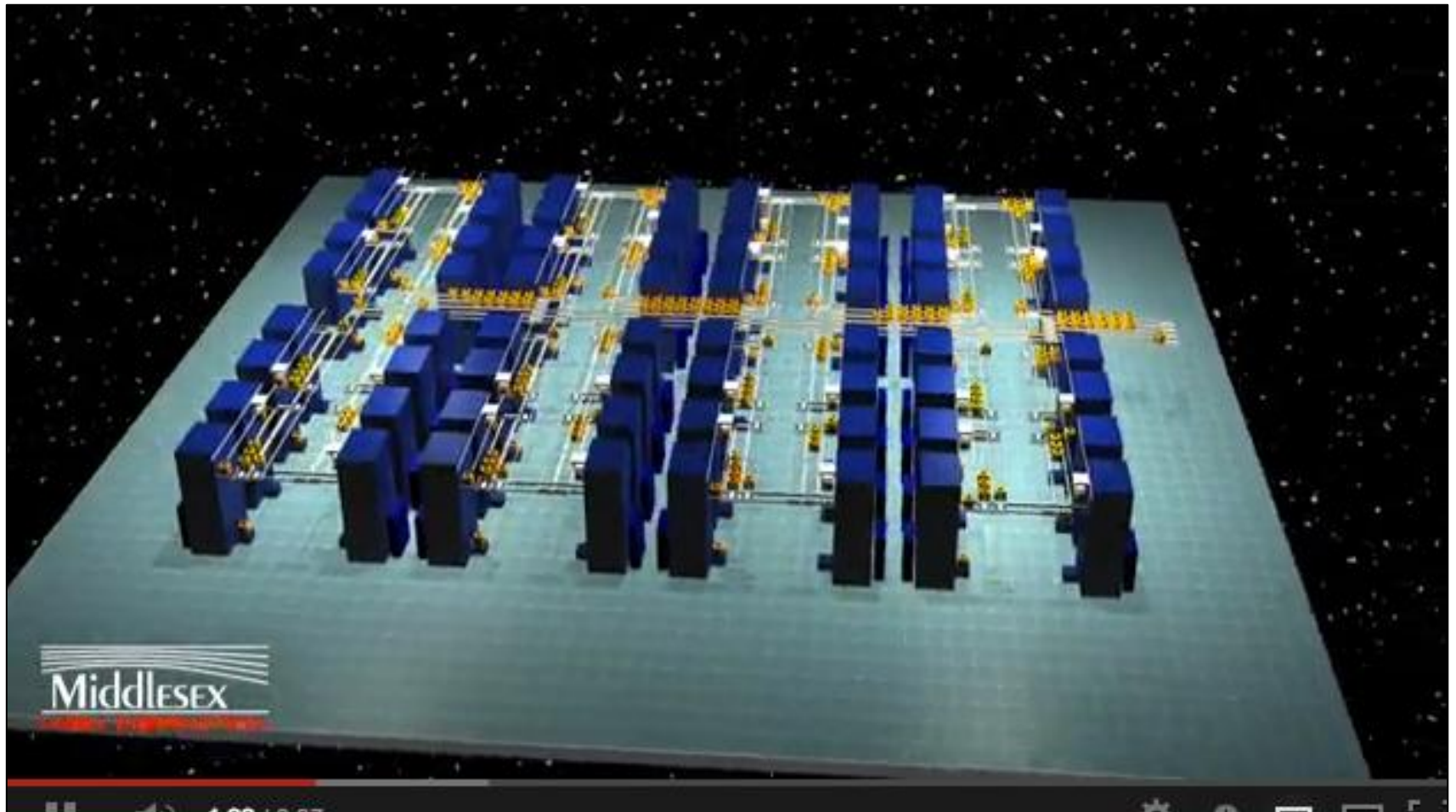
PROCESS & EQUIPMENT I			
Title	Description	Objective	Link
How a CMOS Device Works	An animation of how a CMOS device Works.	Identify the required electrical variables that allow a CMOS device to operate.	Launch iPod / iPhone video
n-Channel Enhancement MOSFET Characteristic Curves	This is an animation of a n-Channel Enhancement MOSFET Characteristic Curves.	Determine the active non-active operation regions of an n-Channel MOSFET gate.	Launch
The Making of the CMOS Microchip	How a CMOS Microchip is made.	Determine the process steps needed to complete a CMOS device.	Launch
The Deposition Process	An animation of the chemical vapor deposition process.	Identify the process of chemical vapor deposition.	Launch
Workflow in the CVD Tool	Animation of Workflow in the CVD Tool.	The steps in the CVD process cycle will be a unique step in the recipe. There may be more steps, or minor variations, but most CVD process recipes will look very similar.	Launch

Making of a CMOS Chip



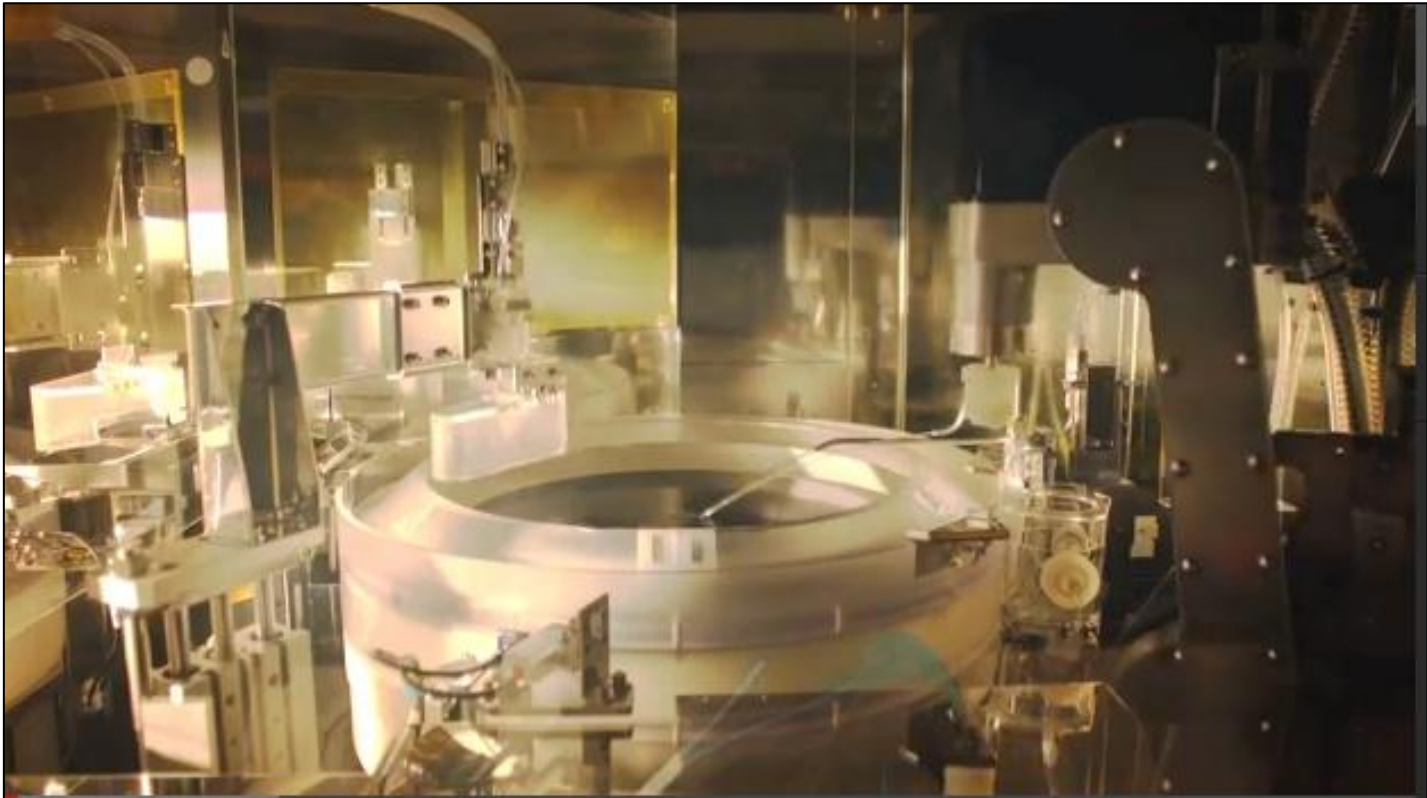
300mm fab animation

(http://www.youtube.com/watch?v=ISxI0_OK5cY)



Video Animation inside a 22nm 3D chip

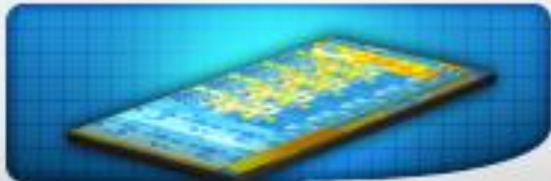
(<http://www.youtube.com/watch?v=YlkMaQJSyP8&list=PL18F9C7D94BFC8685&index=1>)



**Sometimes animated and
animation can get confused**

From Sand to Silicon

(<http://newsroom.intel.com/docs/DOC-2476>)



22nm Process Technology

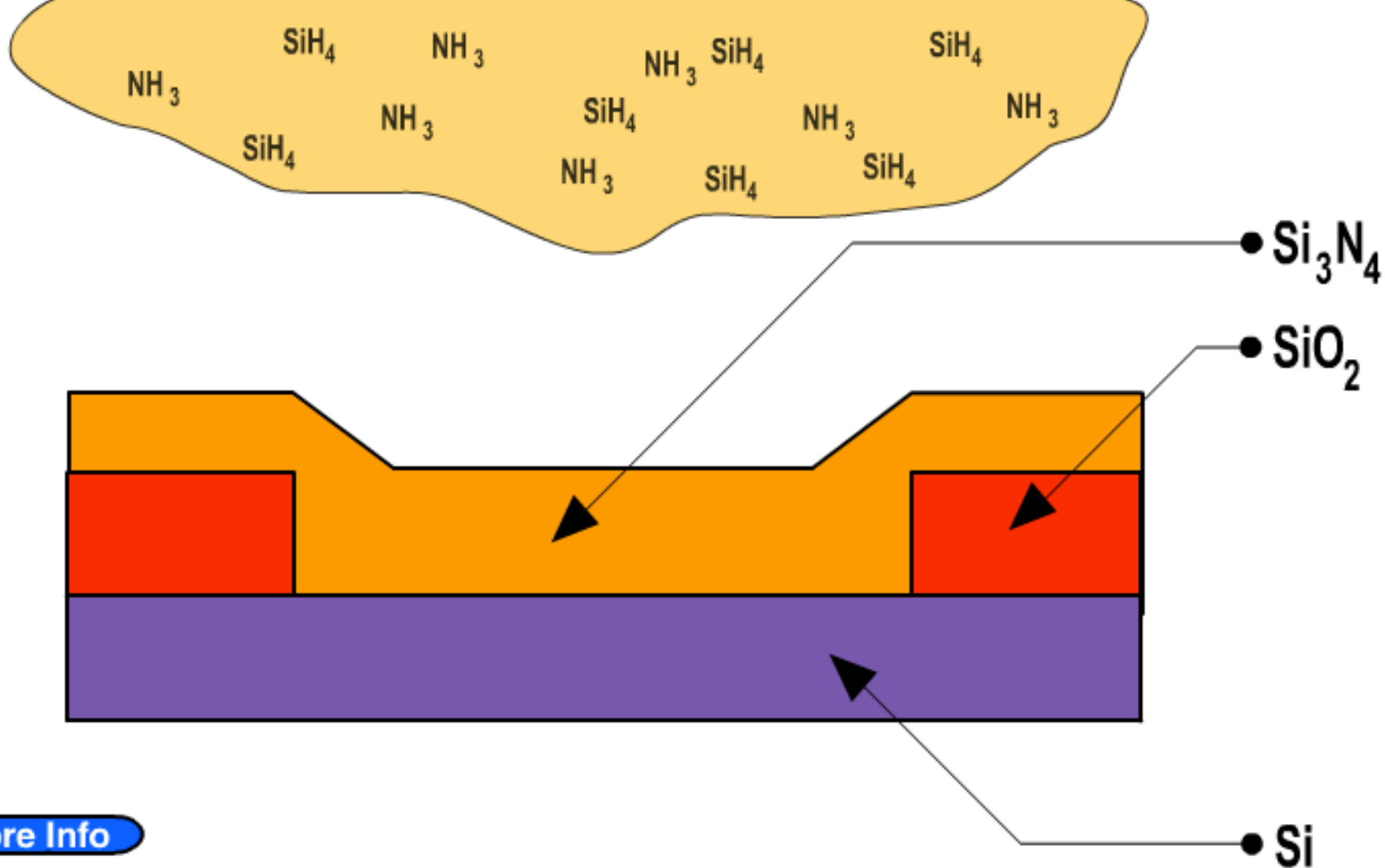


32nm Process Technology



45nm Process Technology

Let's increase the level of interactivity



More Info

The gasses travel to the wafer surface where they chemically react to form a solid thin film. The film develops in stages. First nuclei form, then islands develop, until eventually a continuous film covers the entire surface.

Next

Deposition

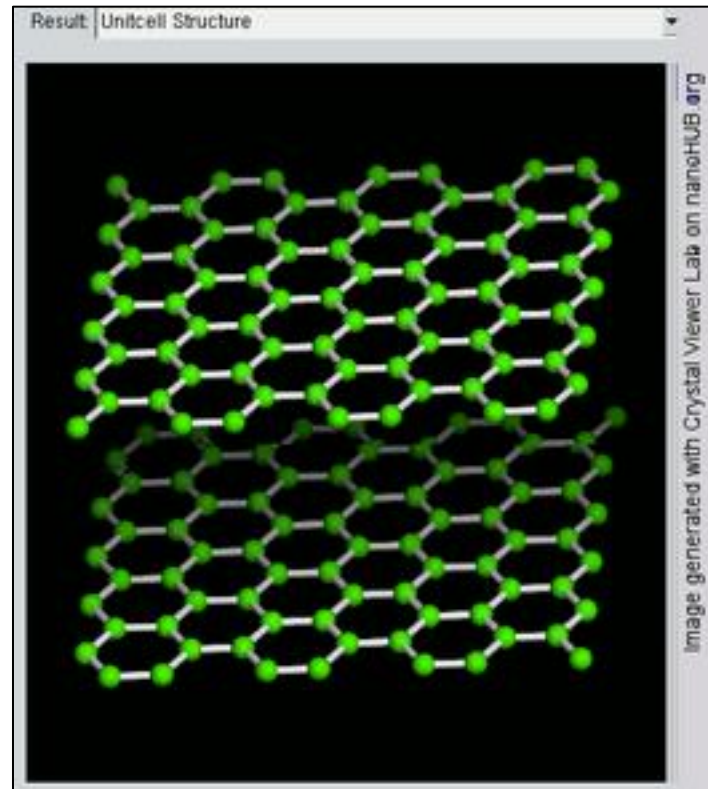
(<http://www.matec.org/animations/matec/M054FL01.swf>)

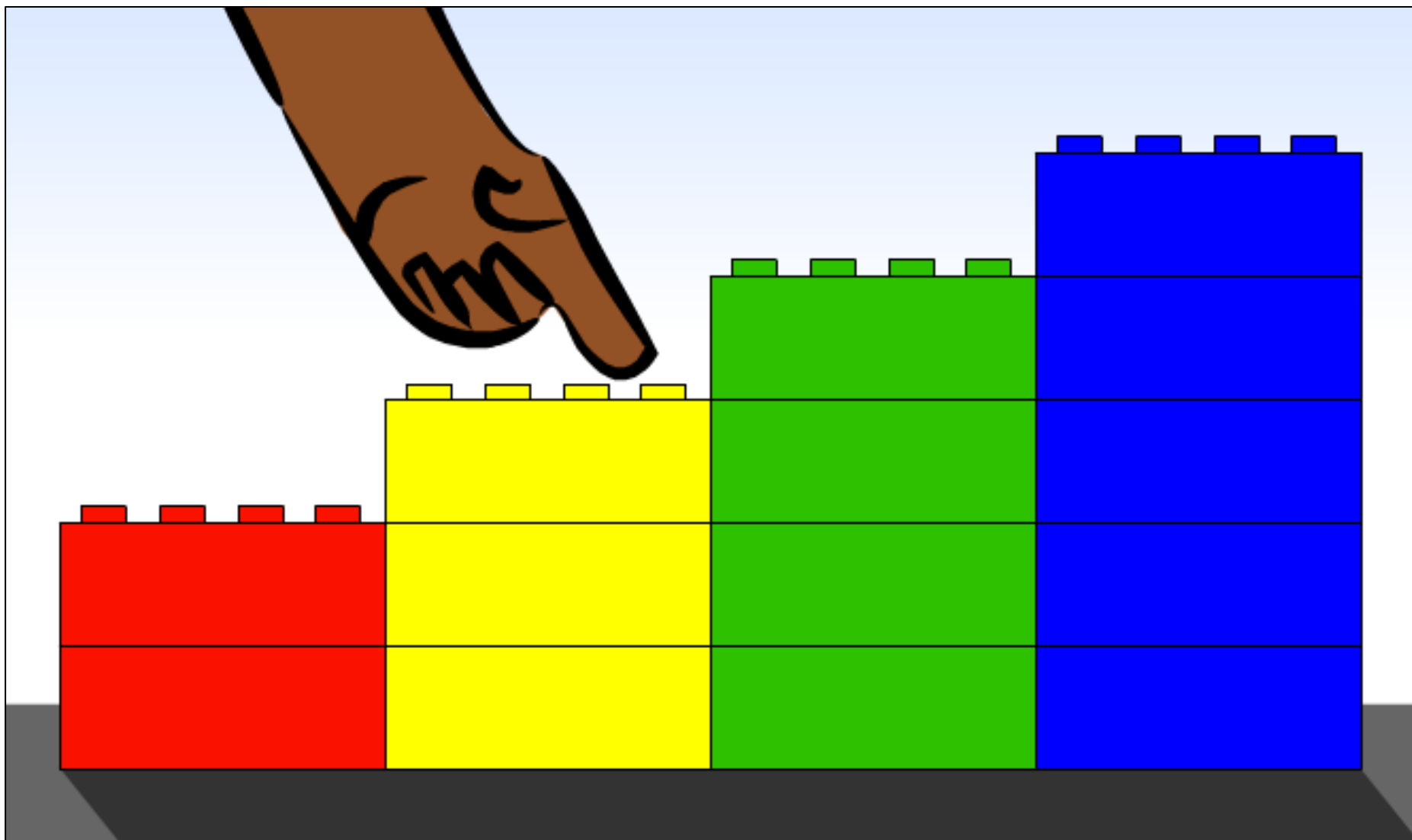
<https://nanohub.org/resources/8882>

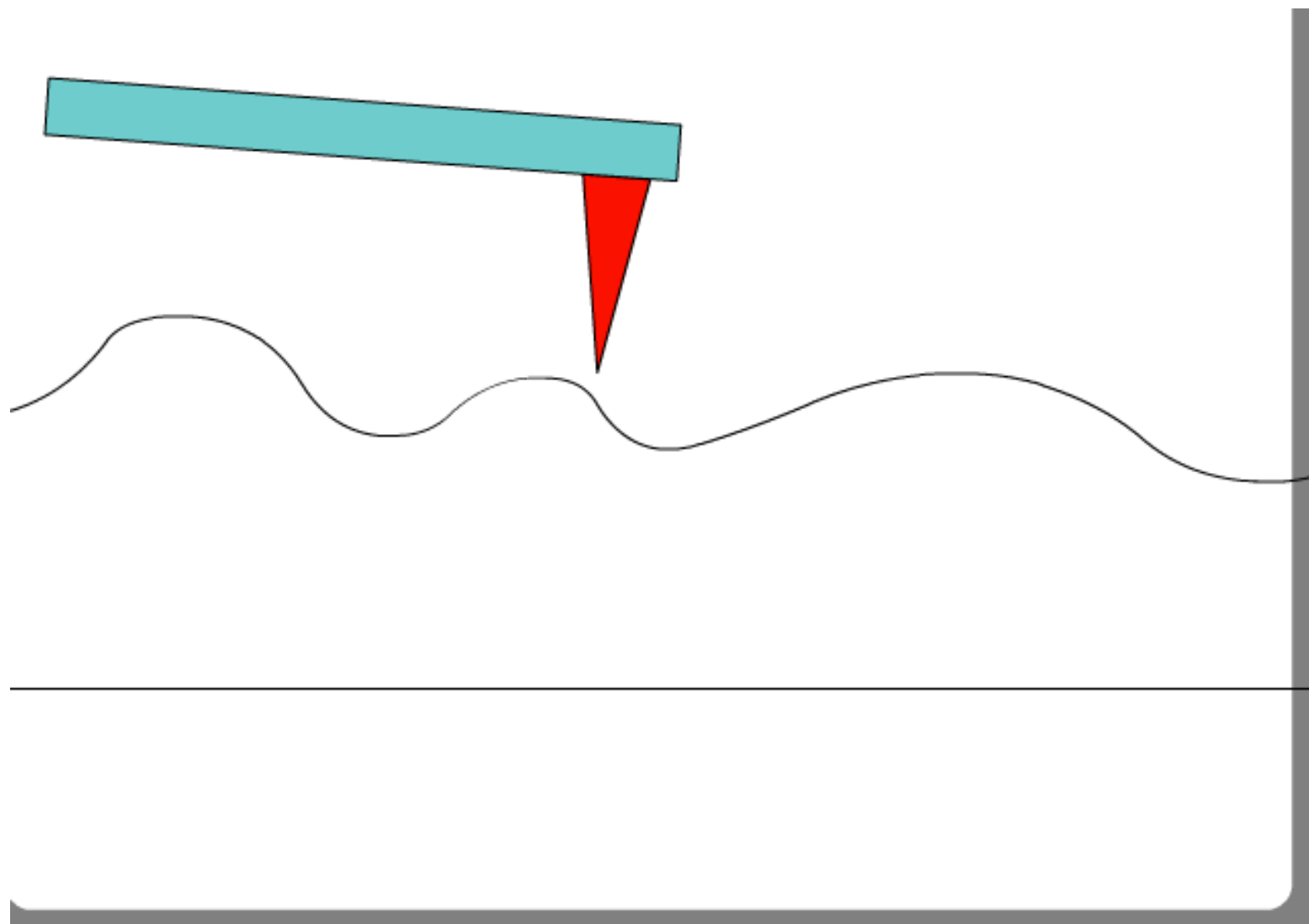
Nanotechnology Animation Gallery

By [Saumitra Raj Mehrotra](#)¹, [Gerhard Klimeck](#)²

1. *Electrical and Computer Engineering, Purdue University, West Lafayette, IN* 2. *Purdue University*

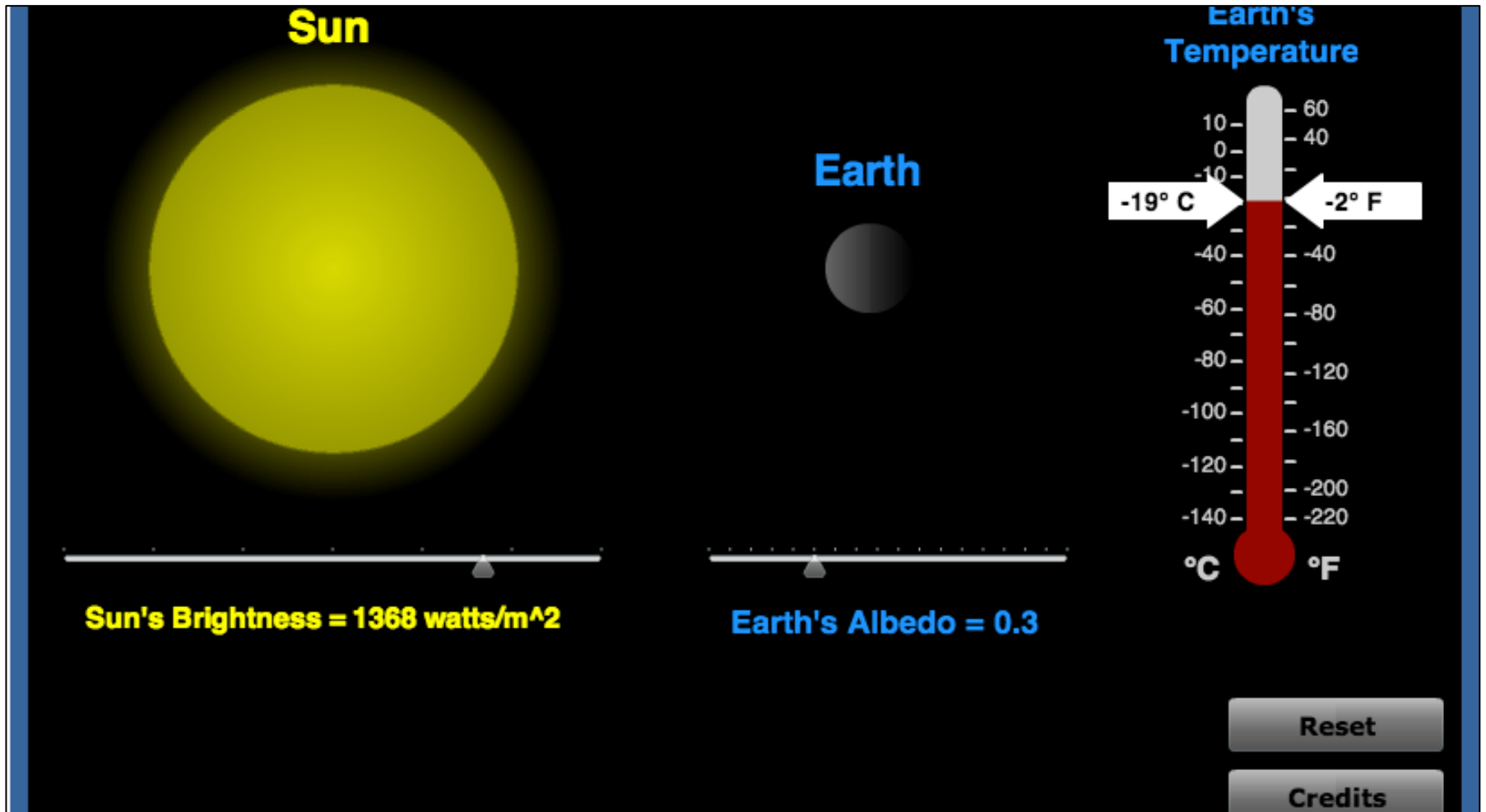






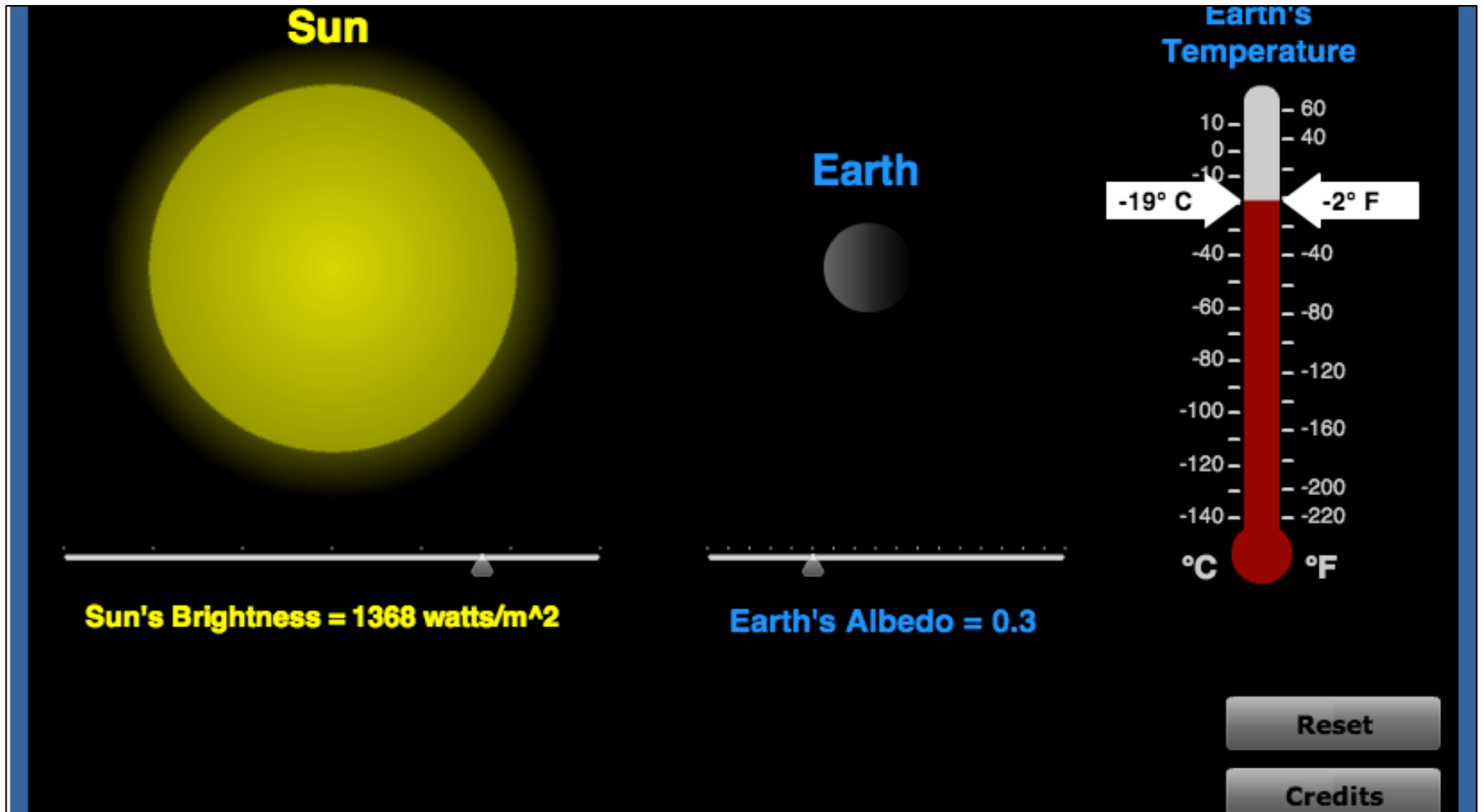
More Interactivity

“Interactives”



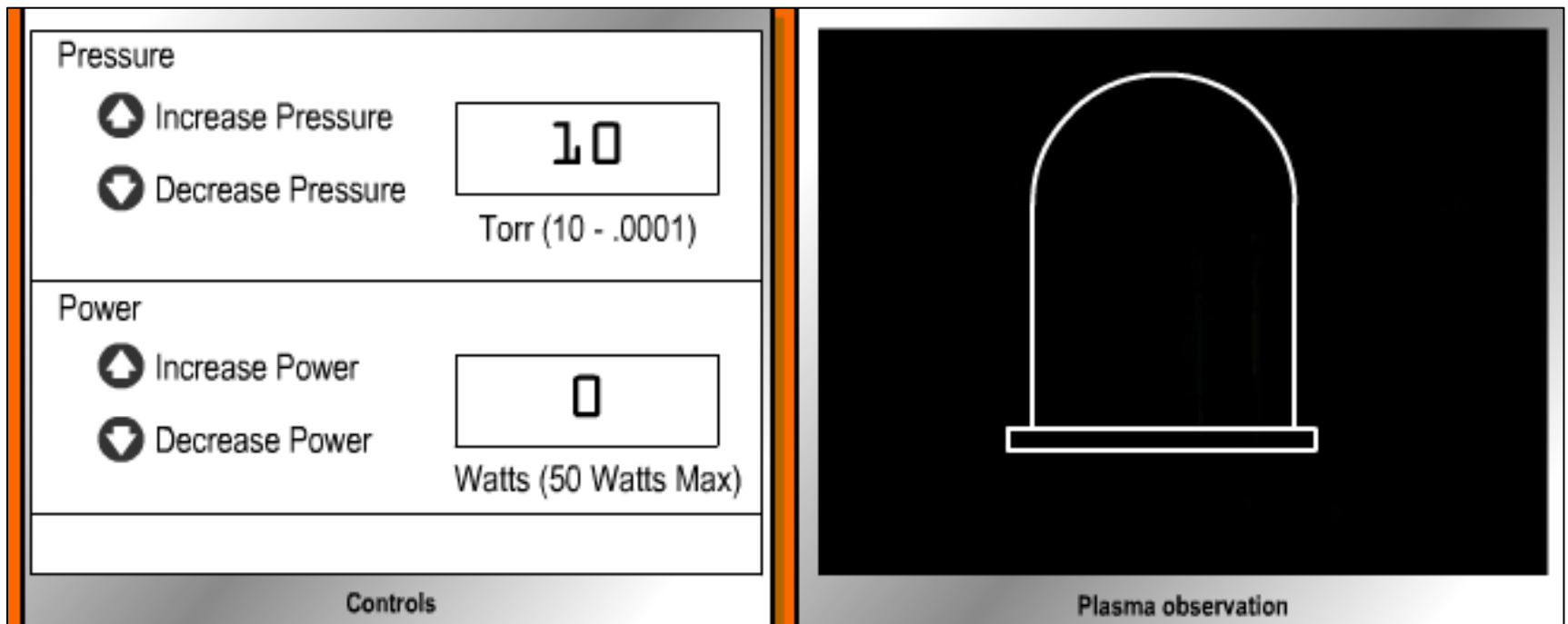
Interactives

(<http://spark.ucar.edu/earths-energy-balance>)



RF Plasma Interactive

(<http://www.matec.org/animations/matec/M104FL02.swf>)

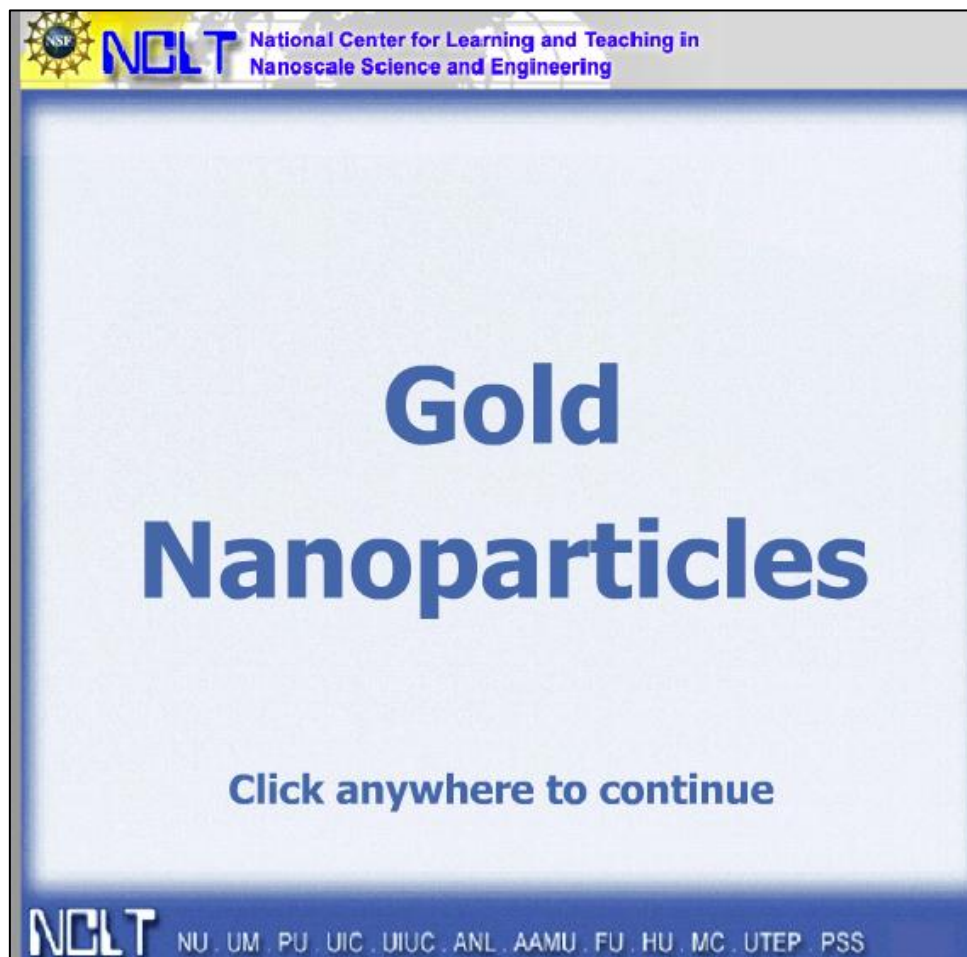


RF Plasma Interactive

<p>Decrease Pressure</p> <p>Increase Pressure</p> <div data-bbox="459 482 855 621">0.01</div> <p>Torr (10 - .0001)</p>	 <p>-Brightness increased 2x-</p>
<p>Decrease Power</p> <p>Increase Power</p> <div data-bbox="459 856 855 995"></div> <p>Watts (50 Watts Max)</p>	
<p>Controls</p>	<p>Plasma observation</p>

It can be a complete lesson

(http://community.nsee.us/concepts_apps/compu_animation/gold_nanoparticles.swf)



Blending

- Now that you have the interactive you can add an “instructor” to make it stand alone
- <http://www.youtube.com/watch?v=xvIFld4iUjw>
- I used screen flow,
<http://www.telestream.net/screenflow/overview.htm>

Videos

- It's a video world
- Keep it short
- Have on a big server or service
- Blend it in

400 Marshmallows in a Vacuum

<http://www.youtube.com/watch?v=ULdmv-iPQvA>



MRS Series: Use for Engagement

(<http://www.mrs.org/inside-science-tv/>)



August 30, 2012
**Nanomaterials for
Energy Efficiency ***



June 28, 2012
**New Hip Implant
Coating ***

Nanomaterials for Energy Efficiency

http://www.youtube.com/watch?feature=player_embedded&v=-WQ28DJWhZk#!

More MRS



July 5, 2012

**The Amazing
Spider Silk ***



July 19, 2012

**Piranha-Proof Armour
Inspires Tough Materials ***

More MRS Videos



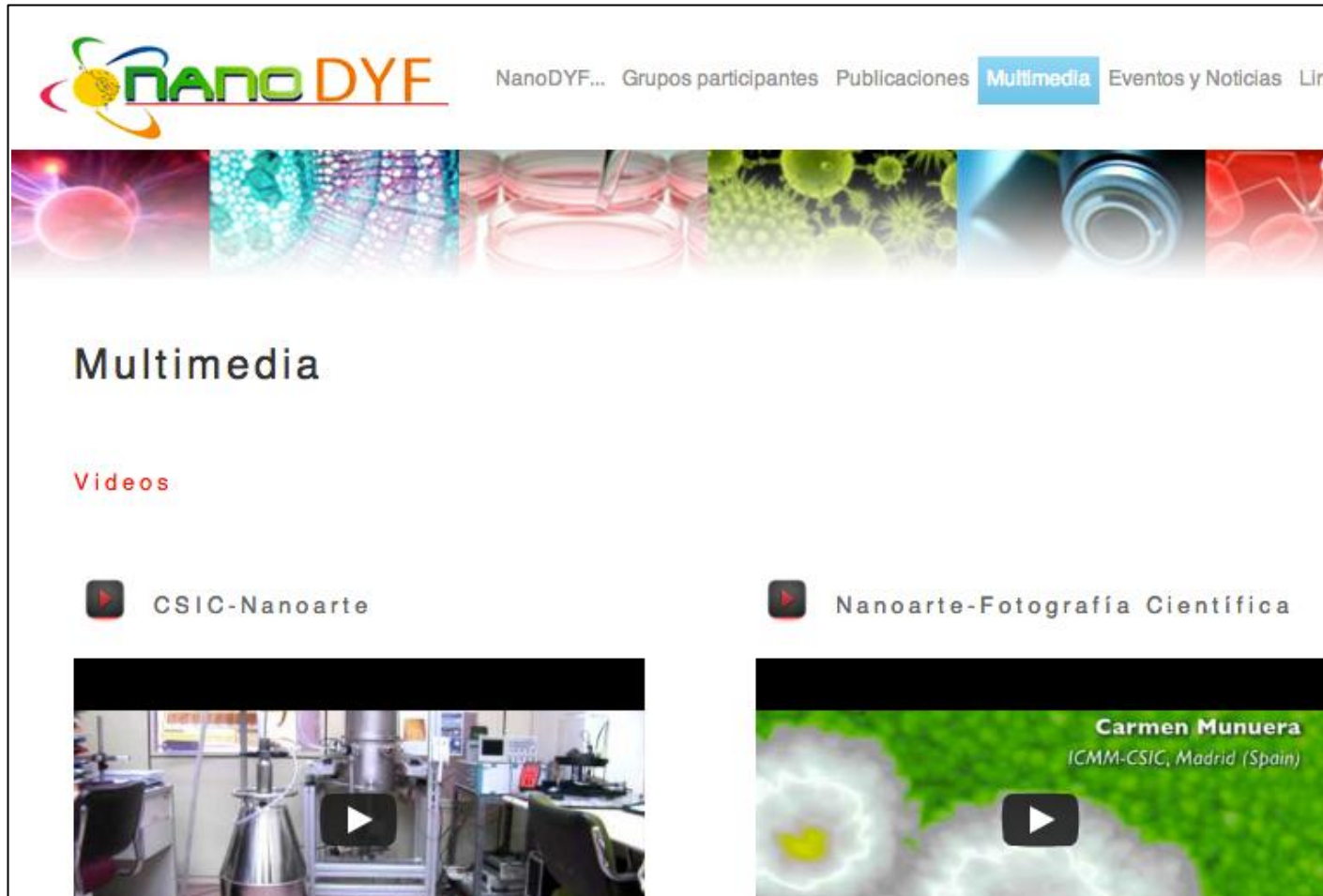
June 12, 2012
**Nanodiamonds
Can Reduce
Pain in Joint
Implants ***



July 24, 2012
**Nanosponge
Soaks Up Oil
Spills ***

Spanish Language Videos on Nanotechnology

(<http://www.nanodyf.org/multimedia.php>)



The screenshot shows the NanoDYF website's multimedia section. At the top is the NanoDYF logo, which features a stylized 'N' with a yellow and orange circular element. To the right of the logo is a navigation menu with links: 'NanoDYF...', 'Grupos participantes', 'Publicaciones', 'Multimedia' (highlighted in a blue box), 'Eventos y Noticias', and 'Links'. Below the navigation menu is a horizontal banner with six colorful images: a glowing pink sphere, a blue and green molecular structure, a pink petri dish, green virus-like particles, a blue mechanical component, and red molecular structures. Below the banner, the word 'Multimedia' is displayed in a large, bold, black font. Underneath 'Multimedia' is the word 'Videos' in a smaller, red font. There are two video thumbnails. The first thumbnail is titled 'CSIC-Nanoarte' and shows a laboratory setting with various pieces of equipment. The second thumbnail is titled 'Nanoarte-Fotografía Científica' and shows a green and white abstract image. Both thumbnails have a play button icon in the center. The second thumbnail also includes the text 'Carmen Munuera' and 'ICMM-CSIC, Madrid (Spain)' in the top right corner.

NanoDYF NanoDYF... Grupos participantes Publicaciones **Multimedia** Eventos y Noticias Links

Multimedia

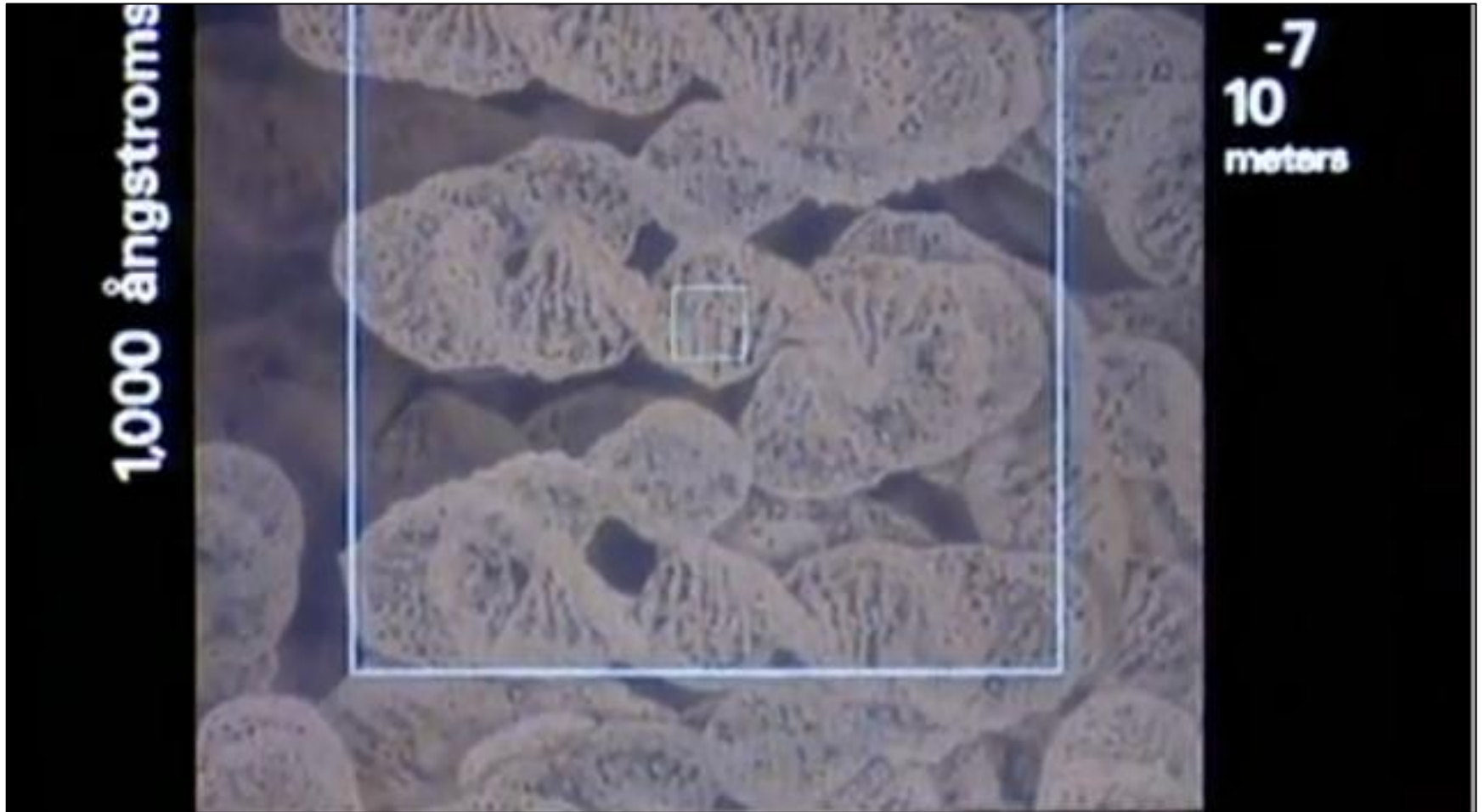
Videos

CSIC-Nanoarte

Nanoarte-Fotografía Científica

Carmen Munuera
ICMM-CSIC, Madrid (Spain)

Powers of 10



http://www.youtube.com/watch?feature=player_embedded&v=OfKBhvDjuy0#!

Simulation

- Perform a skill for practice
- On an environment that is simpler (or safer) than the real world
- Or with practice materials

Simulation

- Simplify real life to make it easier to practice

What is so special about simulations?

The ability to cut away unnecessary detail,
complexity and distractions

Reference: <http://www.learningsim.net/5-step-sims/simulation-design>

What makes a good simulation?

- Make the simulation feel like real work
- Avoid excess complexity
- Make situations, choices, outcomes believable
- Allow choices to influence outcomes
- Keep the rules in the background

Reference: <http://www.learningsim.net/5-step-sims/simulation-design>

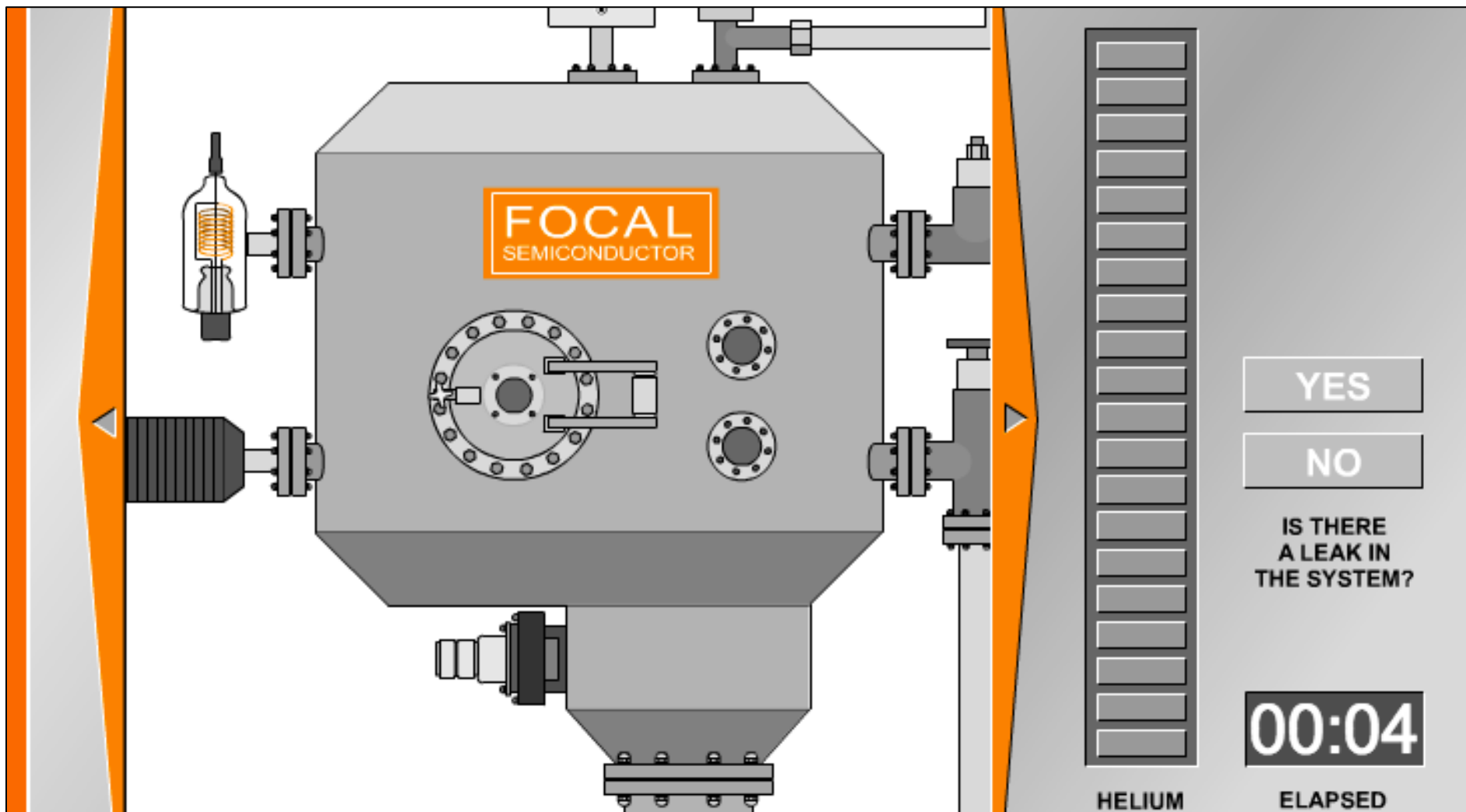
Simulation

- Vacuum leak detection
- <http://www.matec.org/animations/matec/102/M102FL01.swf>

ARE YOU FAMILIAR WITH USING THIS SIMULATOR?

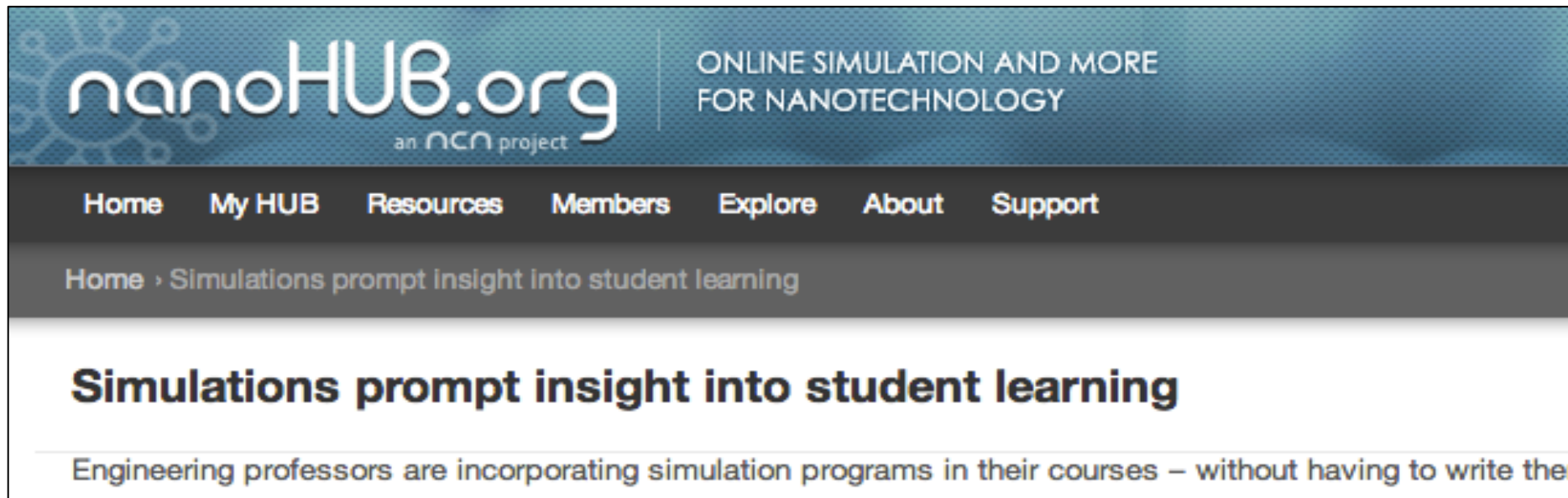
NO, GIVE ME AN OVERVIEW

YES, LET ME GET STARTED



Deeper into Nanotechnology Simulations

(<https://nanohub.org/about/simulate>)



The screenshot shows the top portion of the nanoHUB.org website. The header has a blue background with a molecular structure pattern. On the left is the nanoHUB.org logo, with 'an ncn project' written below it. To the right of the logo, the text 'ONLINE SIMULATION AND MORE FOR NANOTECHNOLOGY' is displayed. Below the header is a dark grey navigation bar with white text links: Home, My HUB, Resources, Members, Explore, About, and Support. Underneath the navigation bar is a grey breadcrumb trail: Home > Simulations prompt insight into student learning. The main content area has a white background and features the title 'Simulations prompt insight into student learning' in bold. Below the title is a horizontal line, and then the text 'Engineering professors are incorporating simulation programs in their courses – without having to write the' is visible.

nanoHUB.org
an ncn project

ONLINE SIMULATION AND MORE
FOR NANOTECHNOLOGY

Home My HUB Resources Members Explore About Support

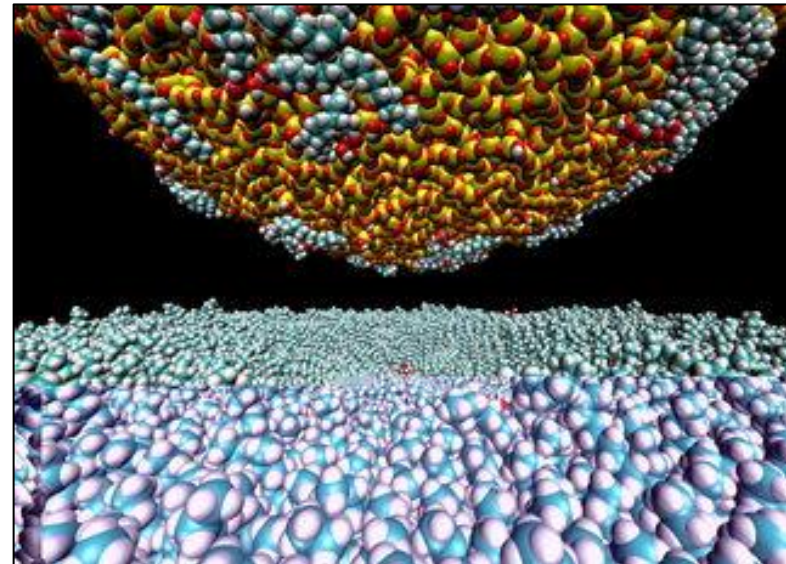
Home > Simulations prompt insight into student learning

Simulations prompt insight into student learning

Engineering professors are incorporating simulation programs in their courses – without having to write the

Simulation vs. Emulation

- A simulation is *similar* to something in its behavior or performance
- An emulation is *exactly* like the system and behaves according to its rules and process.
 - often based on real equations that describe the system



Museum Type Demos

(http://www.mrsec.psu.edu/education/museum_shows/small_wonders/)



CENTER FOR
nanoscale
science

NNIN

(<http://www.nnin.org/education-training/k-12-teachers/nnin-nanotechnology-demonstration-guide>)



Education & Training

[Home](#) » [Education & Training](#) » [K-12 Teachers](#) » NNIN Nanotechnology Demonstration Guide

NNIN Nanotechnology Demonstration Guide

The [demo guide](#) contains short (10 minutes) activities that can be added to other curriculum. These are shorter than the full lessons described elsewhere.

The Demo Guide was developed by NNIN Staff at Georgia Tech. Please post comments and suggestions to Dr. Nancy Healy, healy@mirc.gatech.edu

National Nanotechnology
Infrastructure Network

Outreach Demonstration Guide

Whatisnano.org

Resources

Introductions

Video

Audio

Games

Products & Society

DIY Nano



Intro to Nano video

What's the big deal about nanotechnology? It's all about being really small.



Three Angry Scientists

A 20 minute film meant to inspire conversation about weighing the risks and



Wonders and Worries of Nanotechnology: Who Benefits

A short 2-minute film to



Wonders and Worries of Nanotechnology: Regulation

A short 2-minute film to



Wonders and Worries of Nanotechnology: Ask and Research

A short 2-minute film to

Nanoplunger

<http://www.youtube.com/watch?v=guUgiiCGk2Q>



Webinar Recordings

To access this recording, slides and handout visit

nano4me.org/webinars.php

2013 Events Calendar

- March 22:** Trends in Nano: Program Development
Webinar (Three Part Series)
- April 15-18:** Course Resource Workshop I:
Workshop Safety, Processing & Materials
- April 26:** Successful Models for Nano Outreach
Webinar

Visit www.nano4me.org/webinars for more details
about these and other upcoming webinars.

JOIN US IN MINNEAPOLIS, MN

May 21-23, 2013

MNT

MICRO NANO TECHNOLOGY

CONFERENCE

<http://nano4me.maricopa.edu/micronanoconference>

Thank You!

Thank you for attending the
NACK Network webinar

**Nanotechnology Demos
and Simulations**