Nanotechnology Demos and Simulations

February 22, 2013

NACK NETWORK
Nanotechnology Applications & Career Knowledge
WWW.NANO4ME.ORG

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PENNSTATE
1855

Hosted by MATEC NetWorks *www.matecnetworks.org*

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:

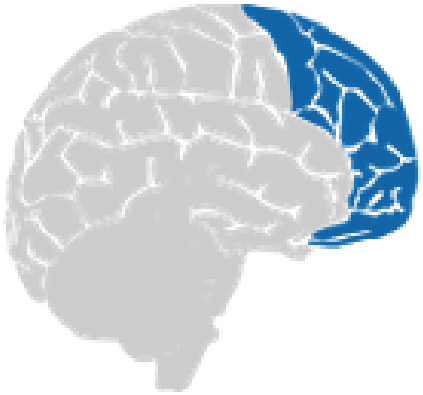
- Present content and information in different ways
- Provide multiple means of engagement

- Universal Design for Learning:
  http://www.cast.org/udl/

Recognition Networks
The "what" of learning

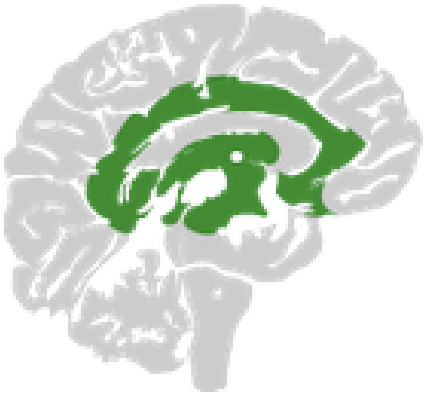
How we gather facts and categorize what we see, hear, and read. Identifying letters, words, or an author's style are recognition tasks.

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?

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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

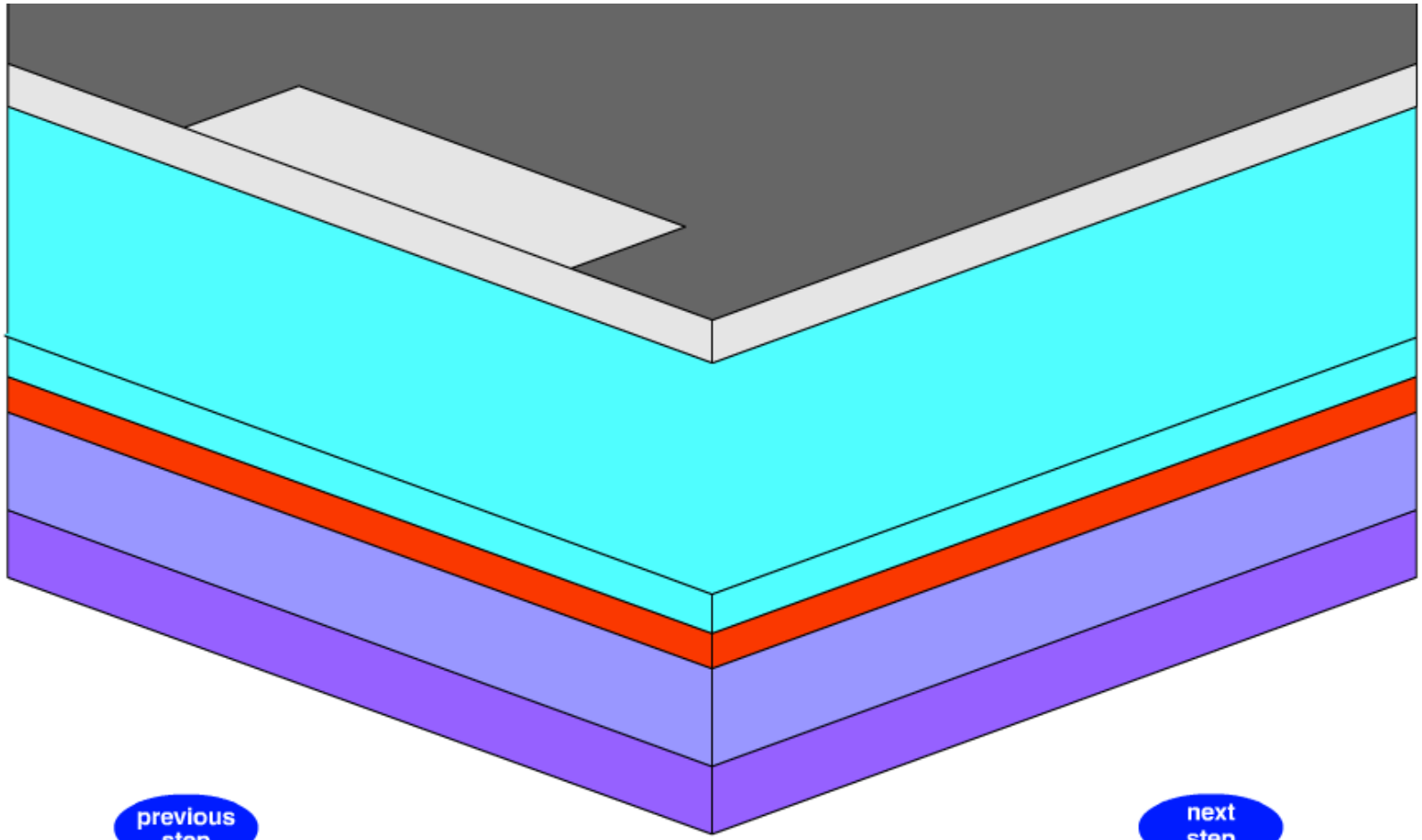
- Show:
  - Animations
  - Interactives
  - Video
- Do:
  - Simple simulations
  - Complex simulations and emulations

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

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

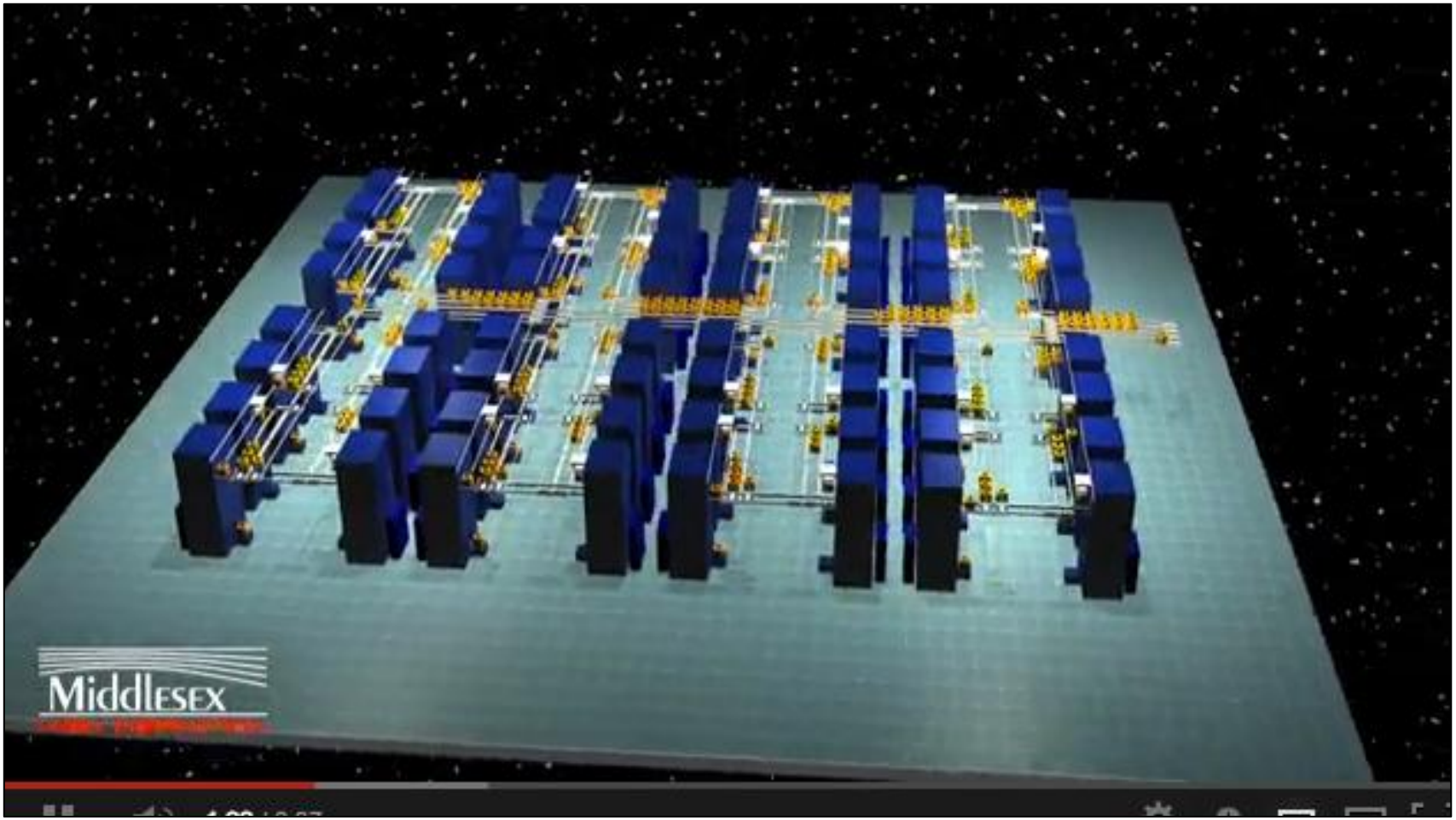


previous step

next step

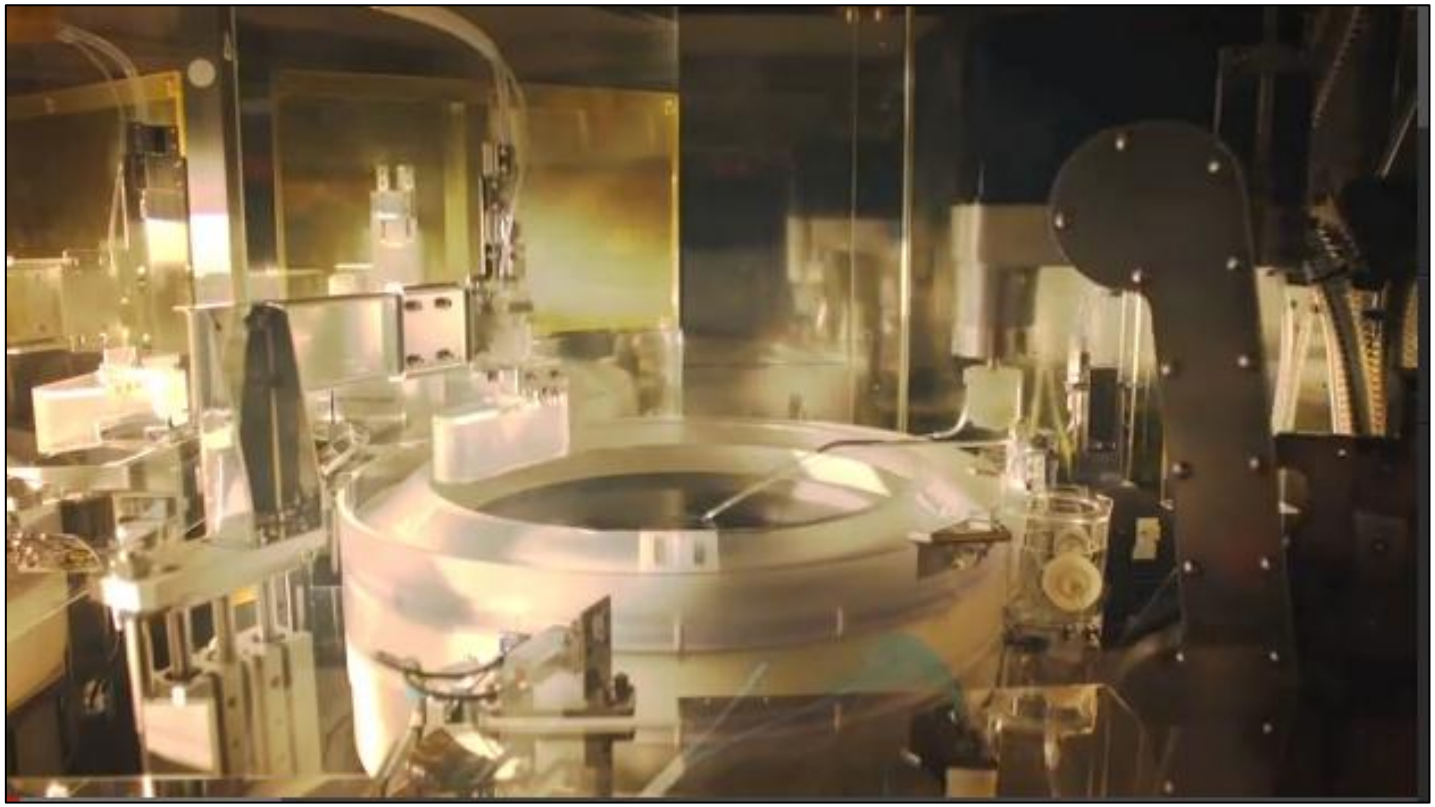
300mm fab animation

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



Video Animation inside a 22nm 3D chip

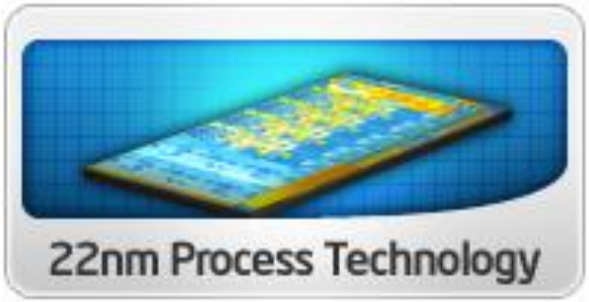
(http://www.youtube.com/watch?v=YIkMaQJSyP8&list=PL18F9C7D94BFC8685&index=1)

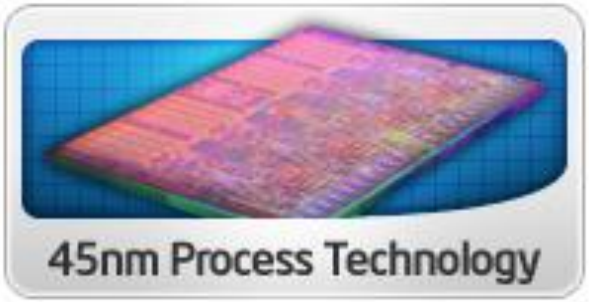


Sometimes animated and animation can get confused

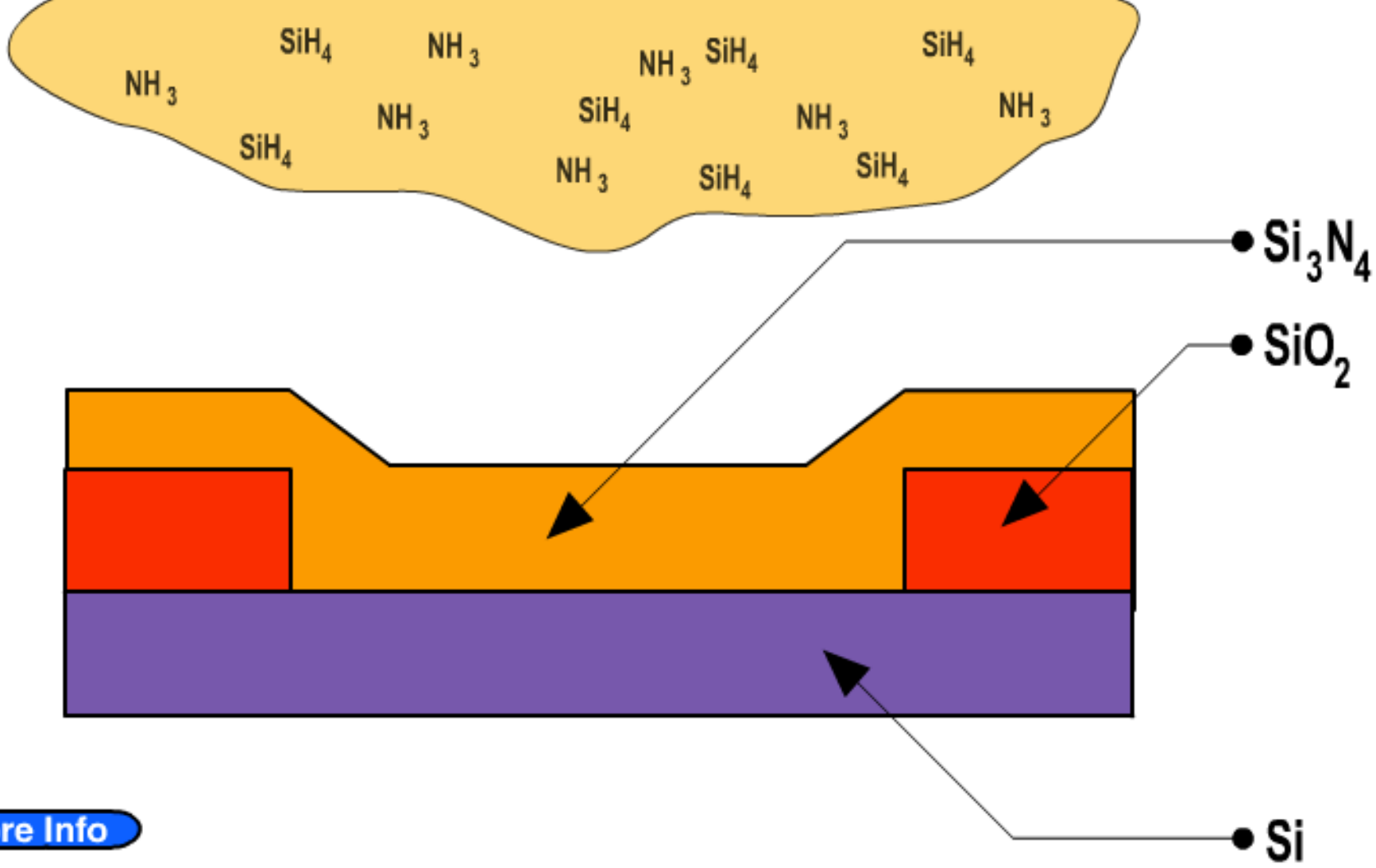
From Sand to Silicon

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





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

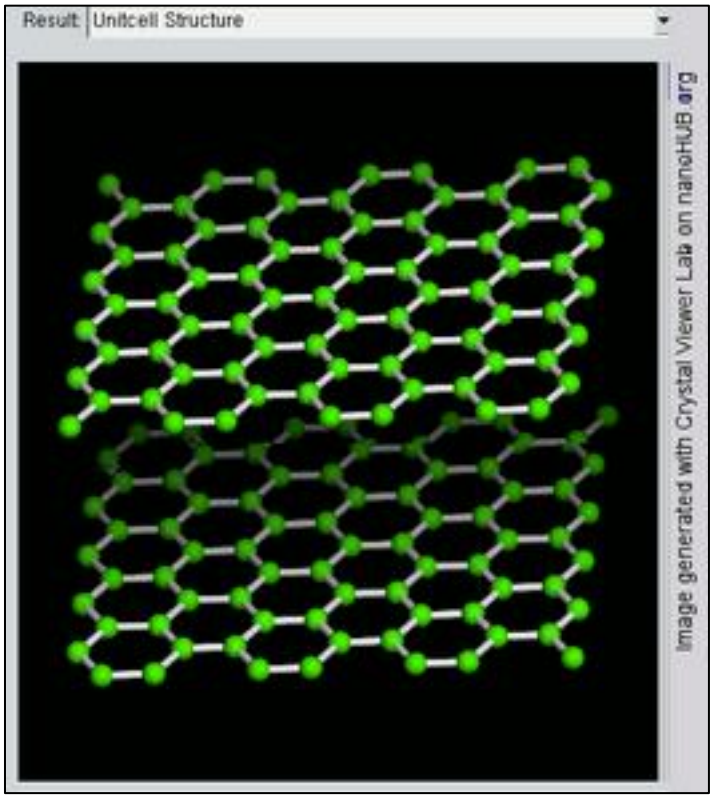
(http://www.matec.org/animations/matec/M054FL01.swf)

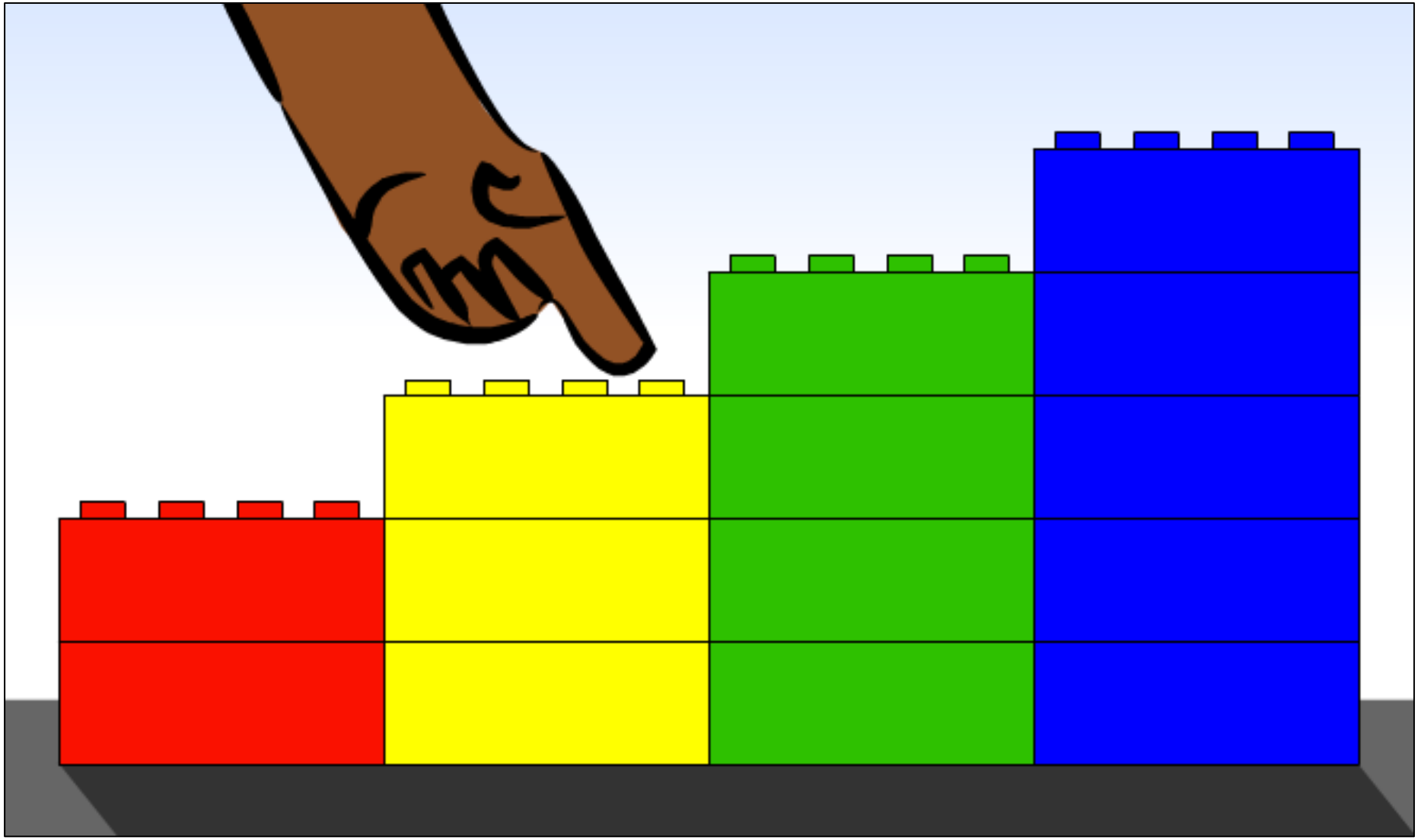
https://nanohub.org/resources/8882

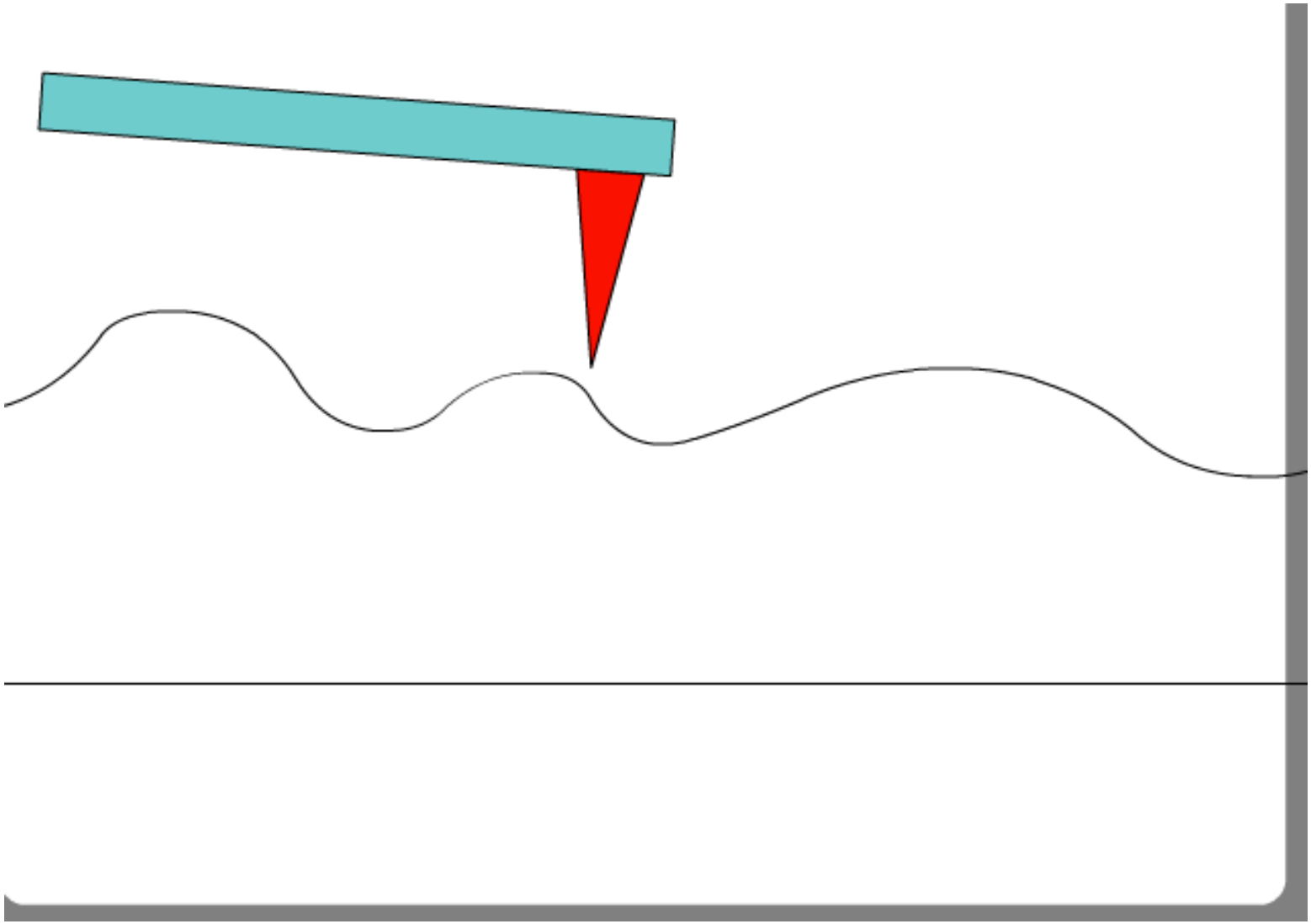
Nanotechnology Animation Gallery

By Saumitra Raj Mehrotra[1], Gerhard Klimeck[2]

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

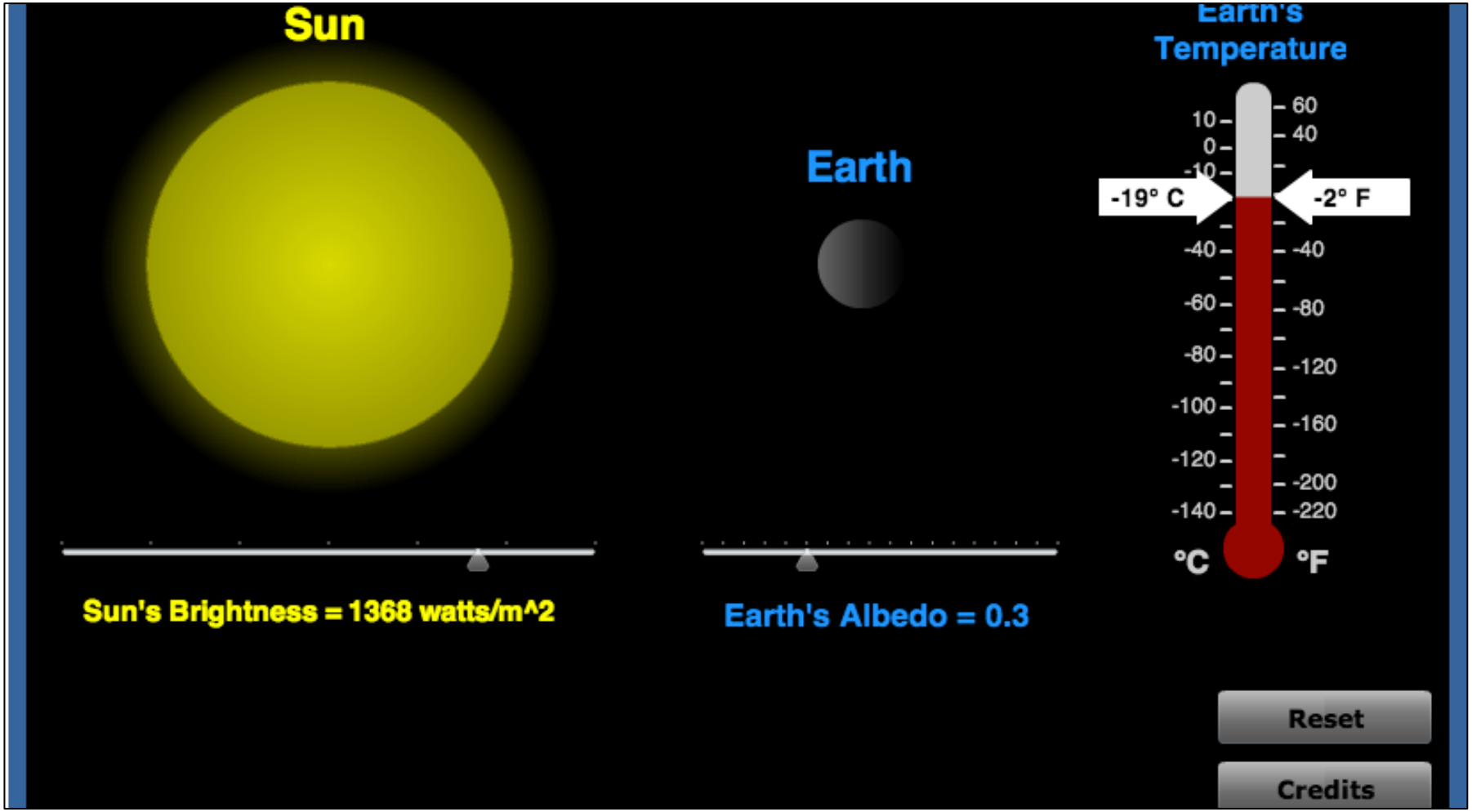






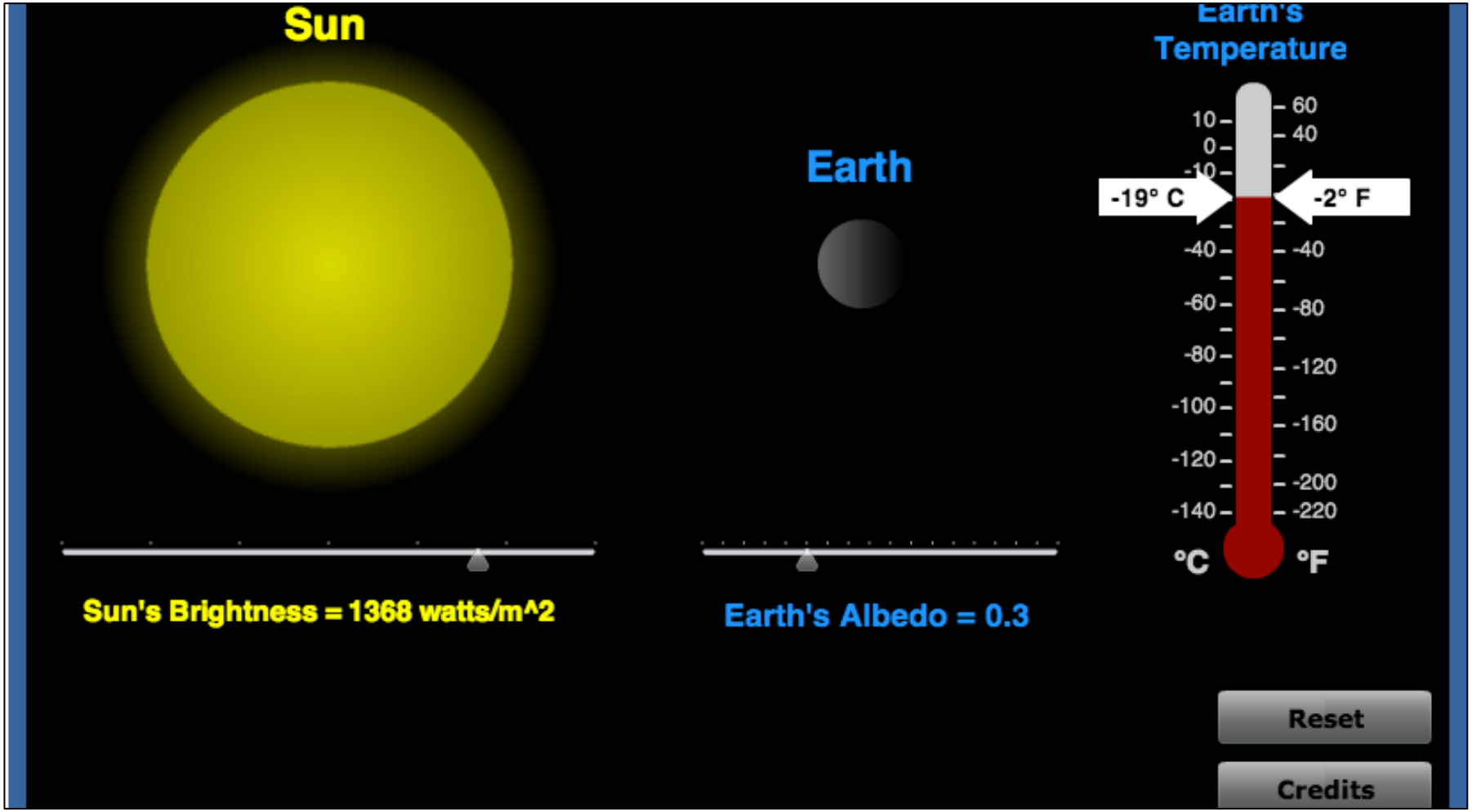
More Interactivity

"Interactives"



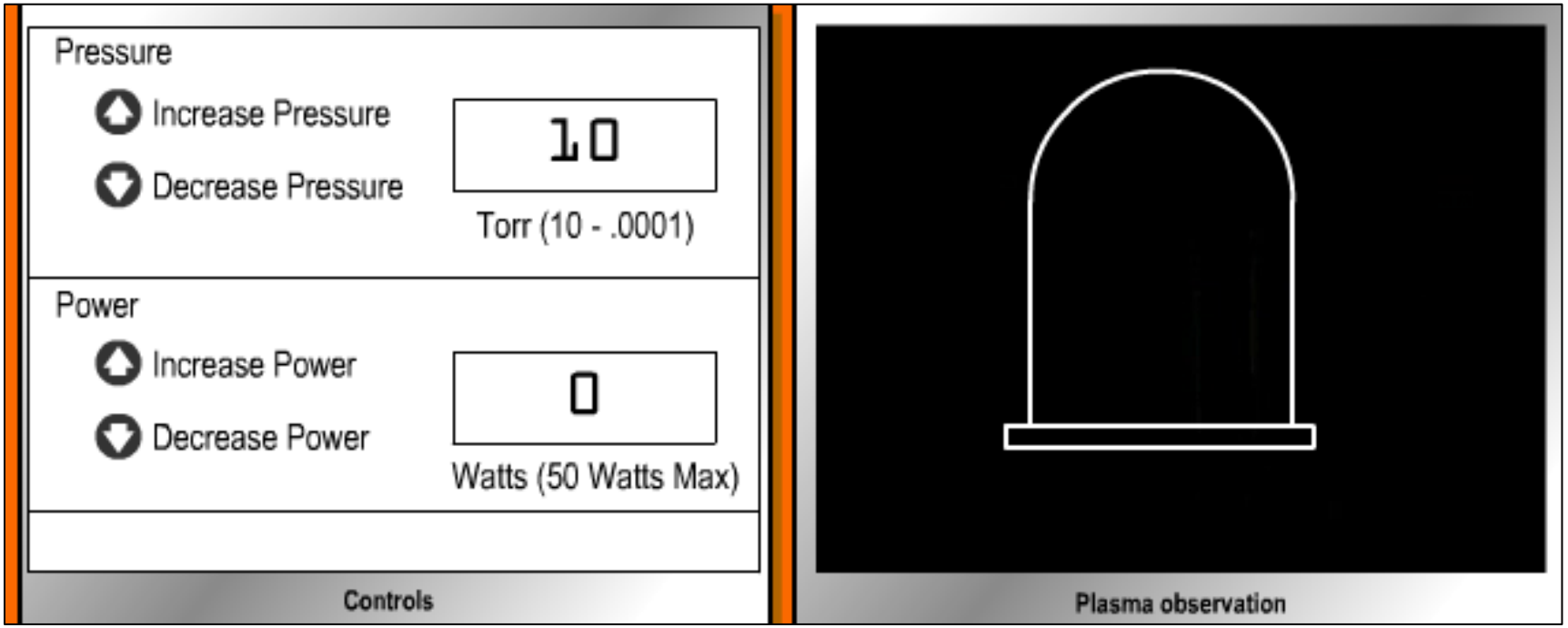
Interactives

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



RF Plasma Interactive

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



RF Plasma Interactive

It can be a complete lesson

(http://community.nsee.us/concepts_apps/compu_anime/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=xvlFld4iUjw
- I used screen flow, http://www.telestream.net/screenflow/overview.htm

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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/)

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Nanomaterials for Energy Efficiency

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

More MRS

July 5, 2012
The Amazing Spider Silk *

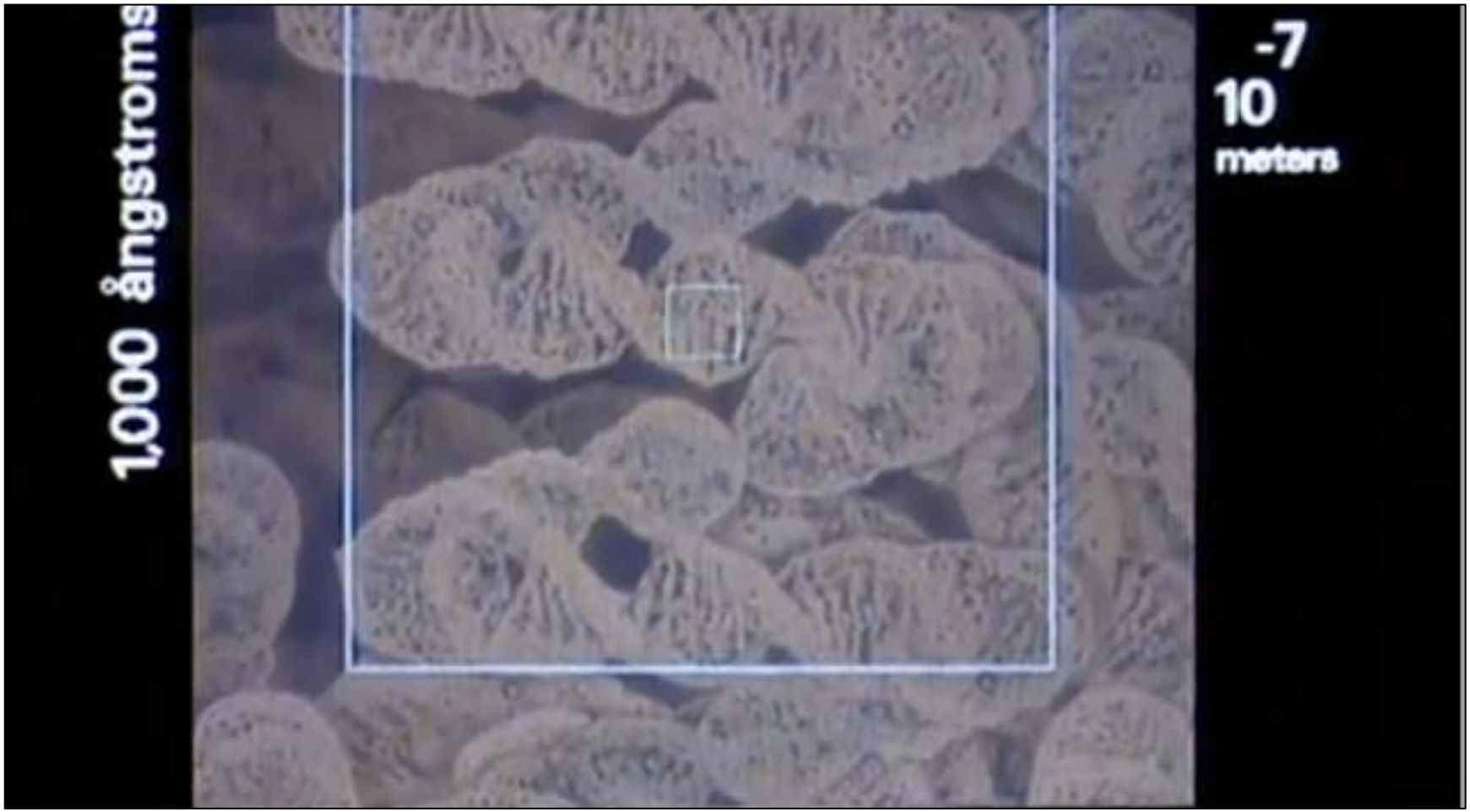
July 19, 2012
Piranha-Proof Armour Inspires Tough Materials *

More MRS Videos

Spanish Language Videos on Nanotechnology

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

Powers of 10



http://www.youtube.com/watch?feature=player_embedded&v=0fKBhvDjuy0#!

Simulation

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

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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

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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

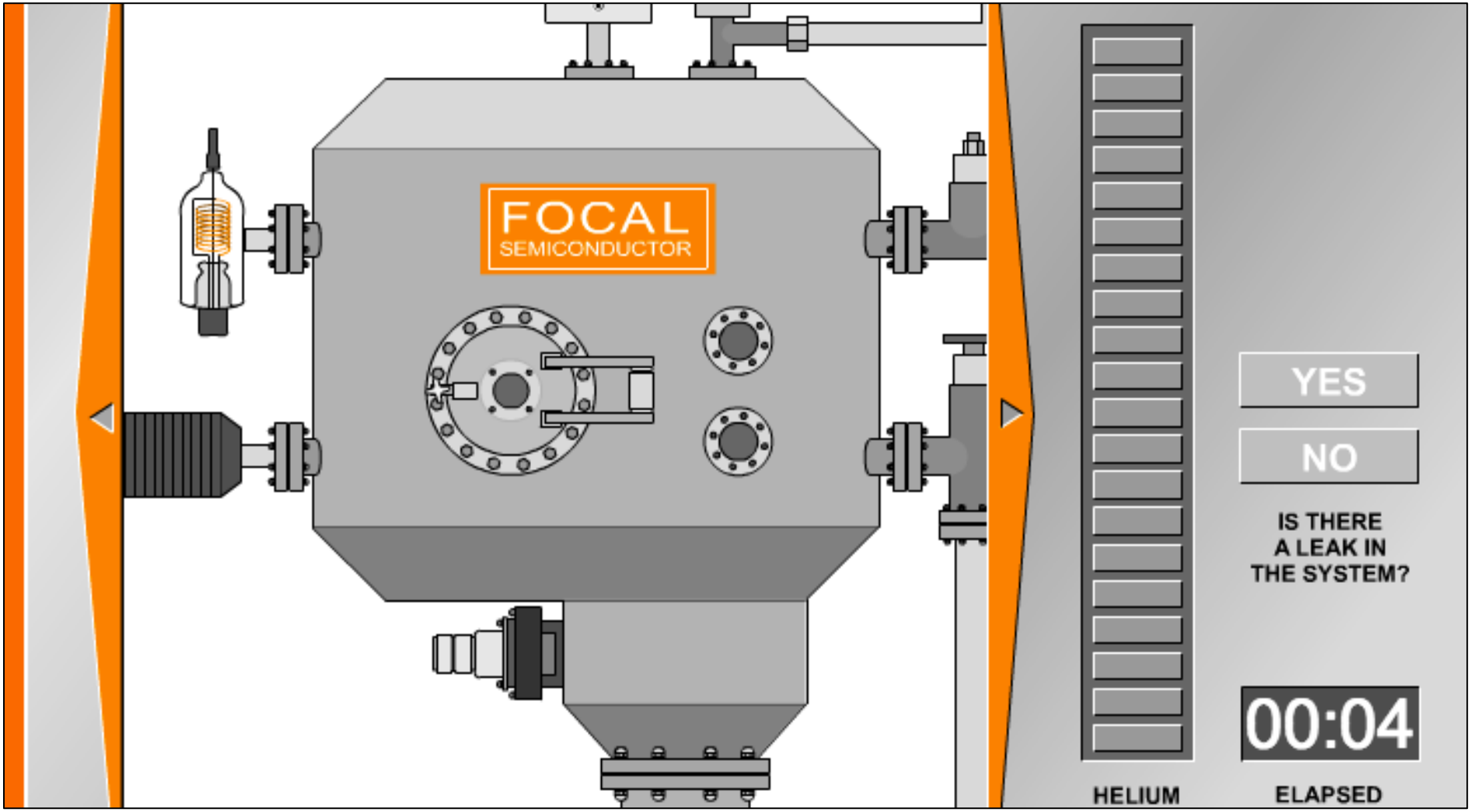
Simulation

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

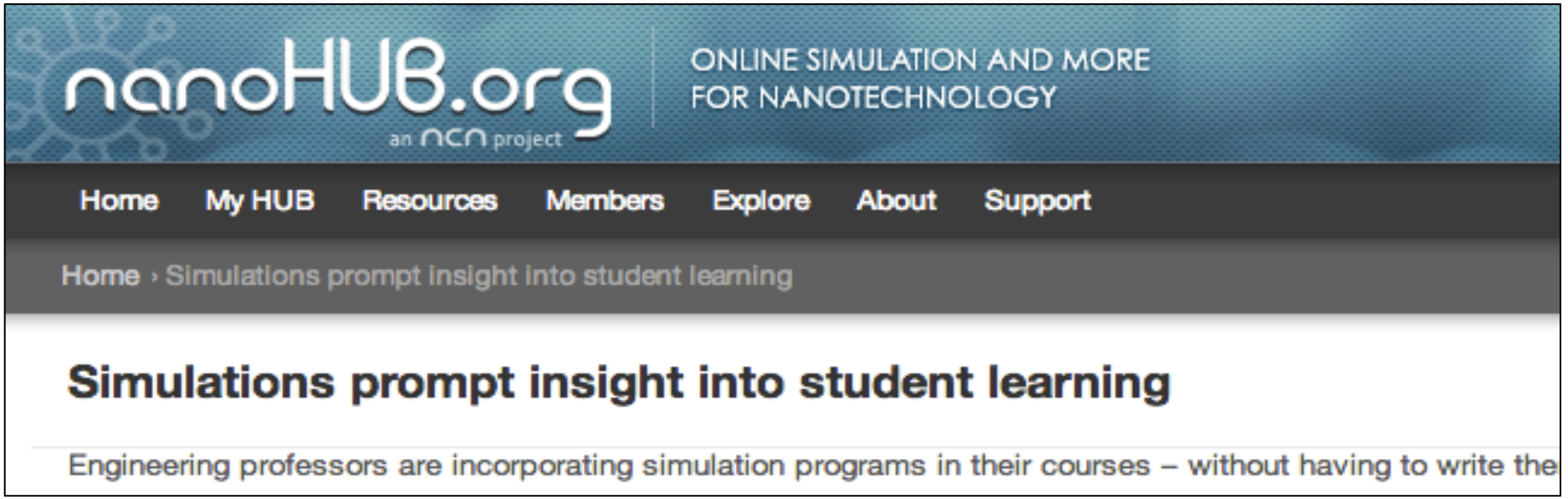
ARE YOU FAMILIAR WITH USING THIS SIMULATOR?

NO, GIVE ME AN OVERVIEW

YES, LET ME GET STARTED

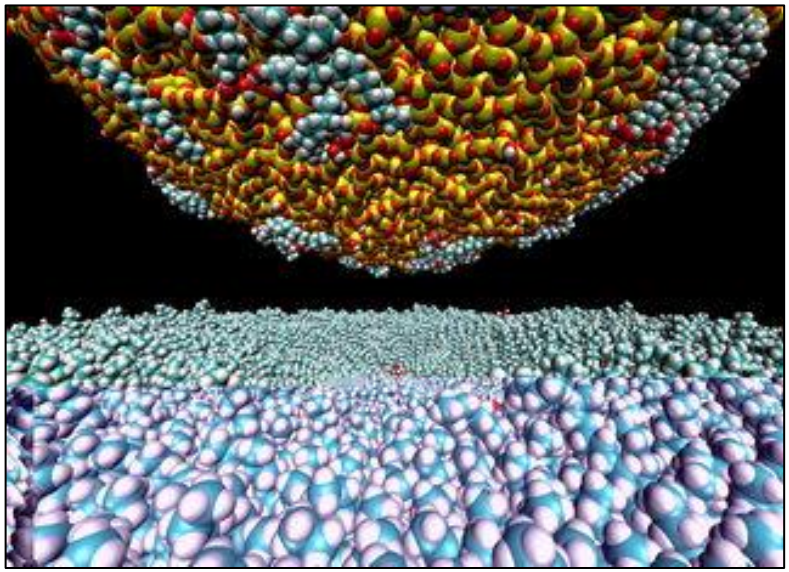

FOCAL
SEMICONDUCTOR
YES
NO
IS THERE
A LEAK IN
THE SYSTEM?
00:04
HELIUM
ELAPSED

Deeper into Nanotechnology Simulations
(https://nanohub.org/about/simulate)



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/)

NNIN

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

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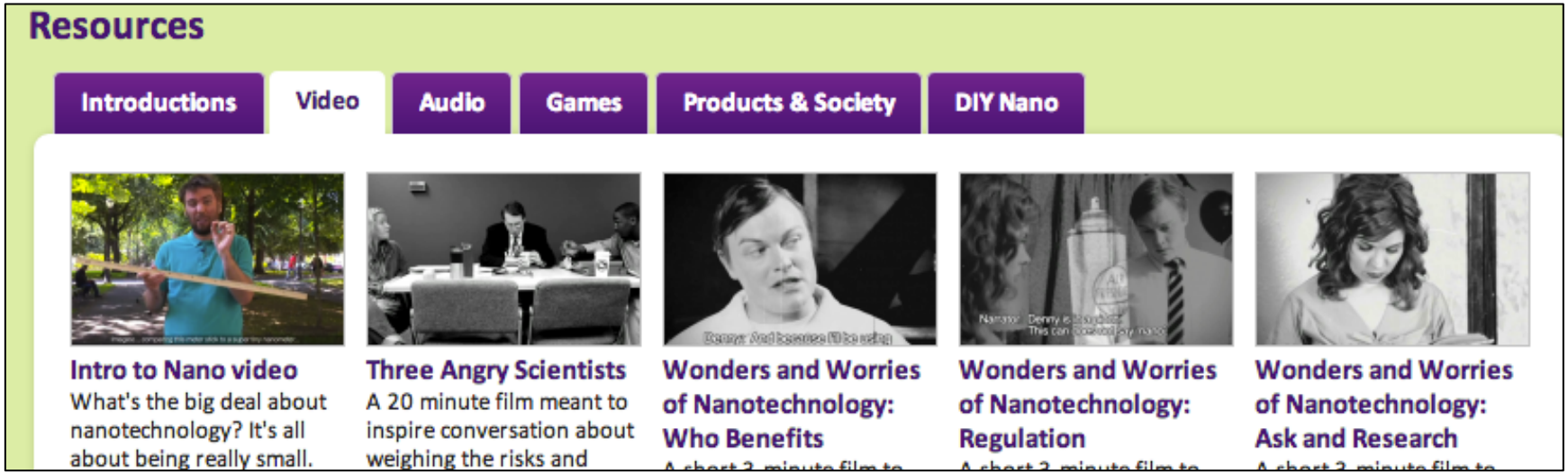
Whatisnano.org



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

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

JOIN US IN MINNEAPOLIS, MN

May 21-23, 2013

http://nano4me.maricopa.edu/micronanoconference

Thank You!

Thank you for attending the

NACK Network webinar

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