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"The amazing challenge of Dr. Tom Bishop's Project!"

Problem: How can I present the DNA Maker and Chromatin Folding on Bishop's Theoretical Molecular Biology Lab webpage in a way that is usable by middle and high school students?

Bishop's Theoretical Molecular Biology Lab

RET PRESENTATION BY:
MARY BETH MCCOY
JULY 2012

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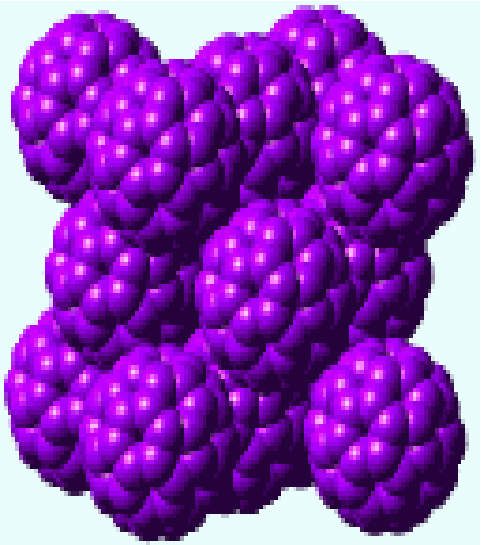
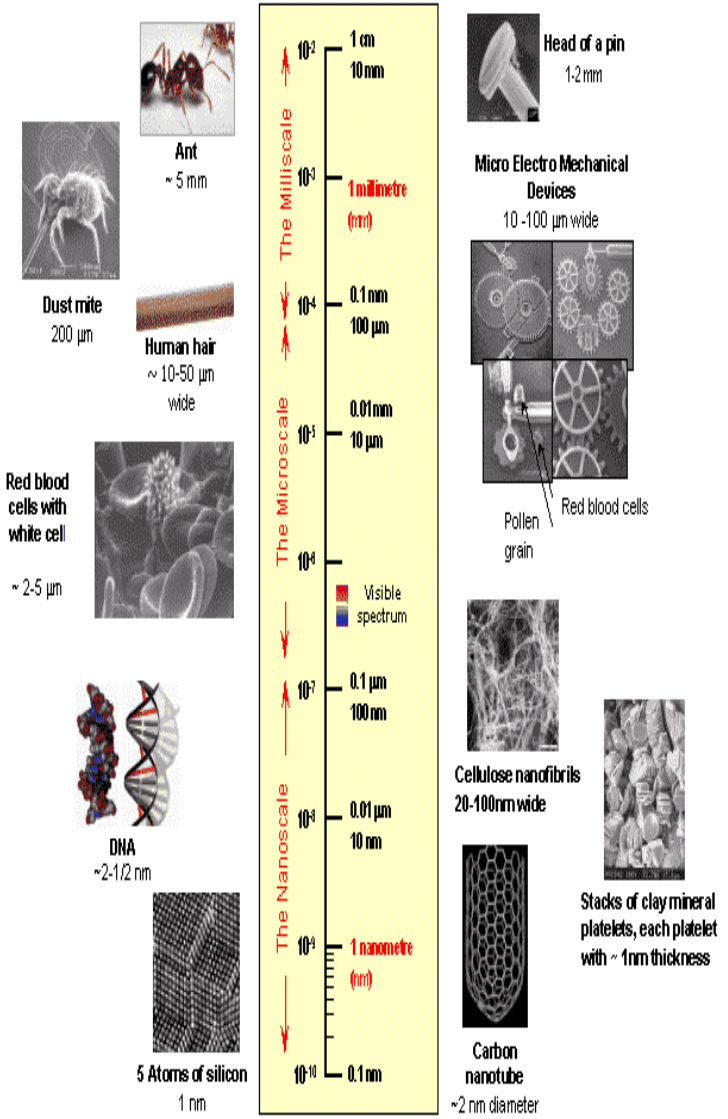
Let's review what a nanotechnology actually is

- http://www.youtube.com/watch?v=rcWfHOjiQ4Q



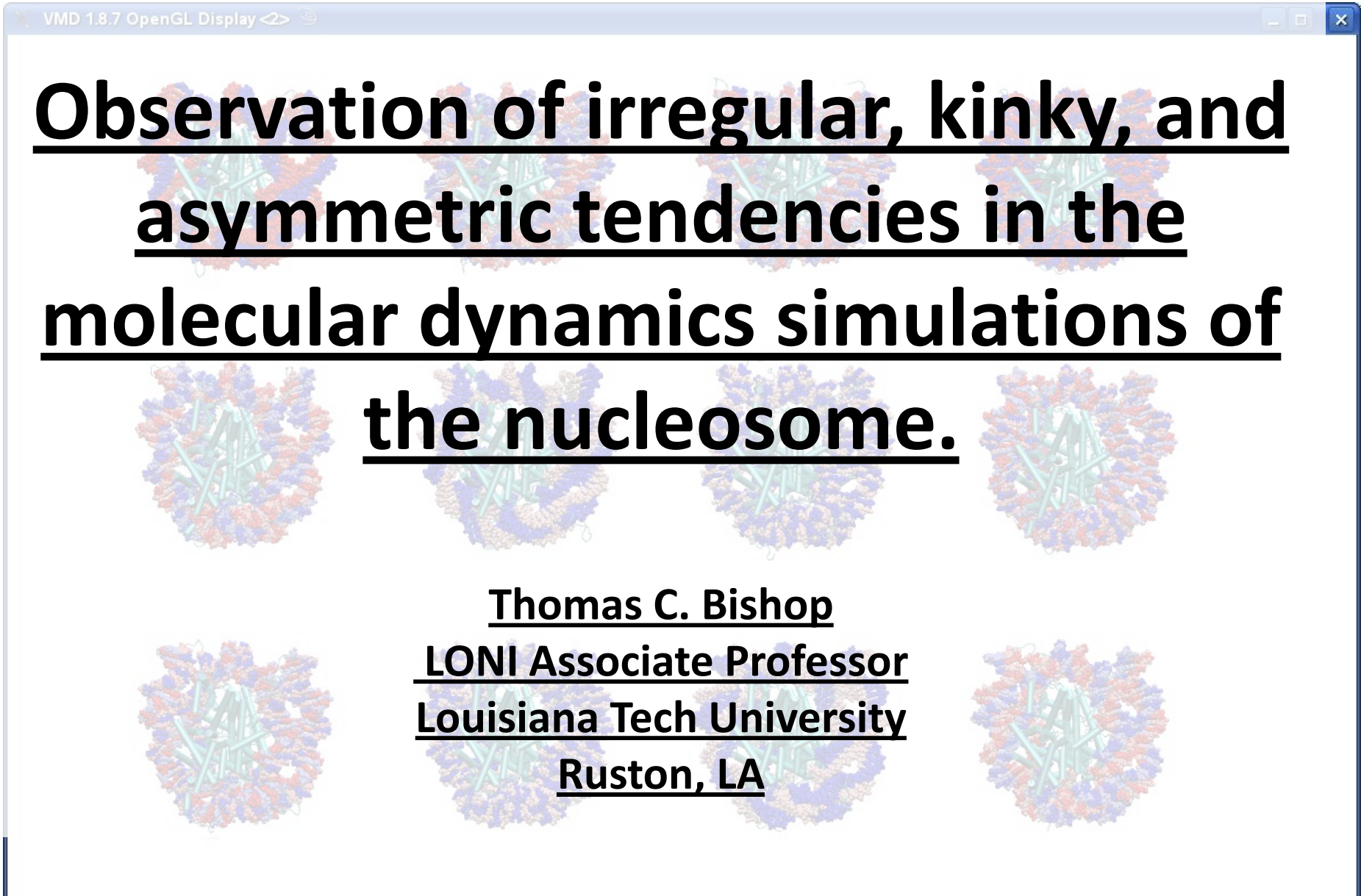


What is DNA and How does it Work?

This movie will show you the basic concepts of DNA and how it works.

Great review for 6-12th graders!

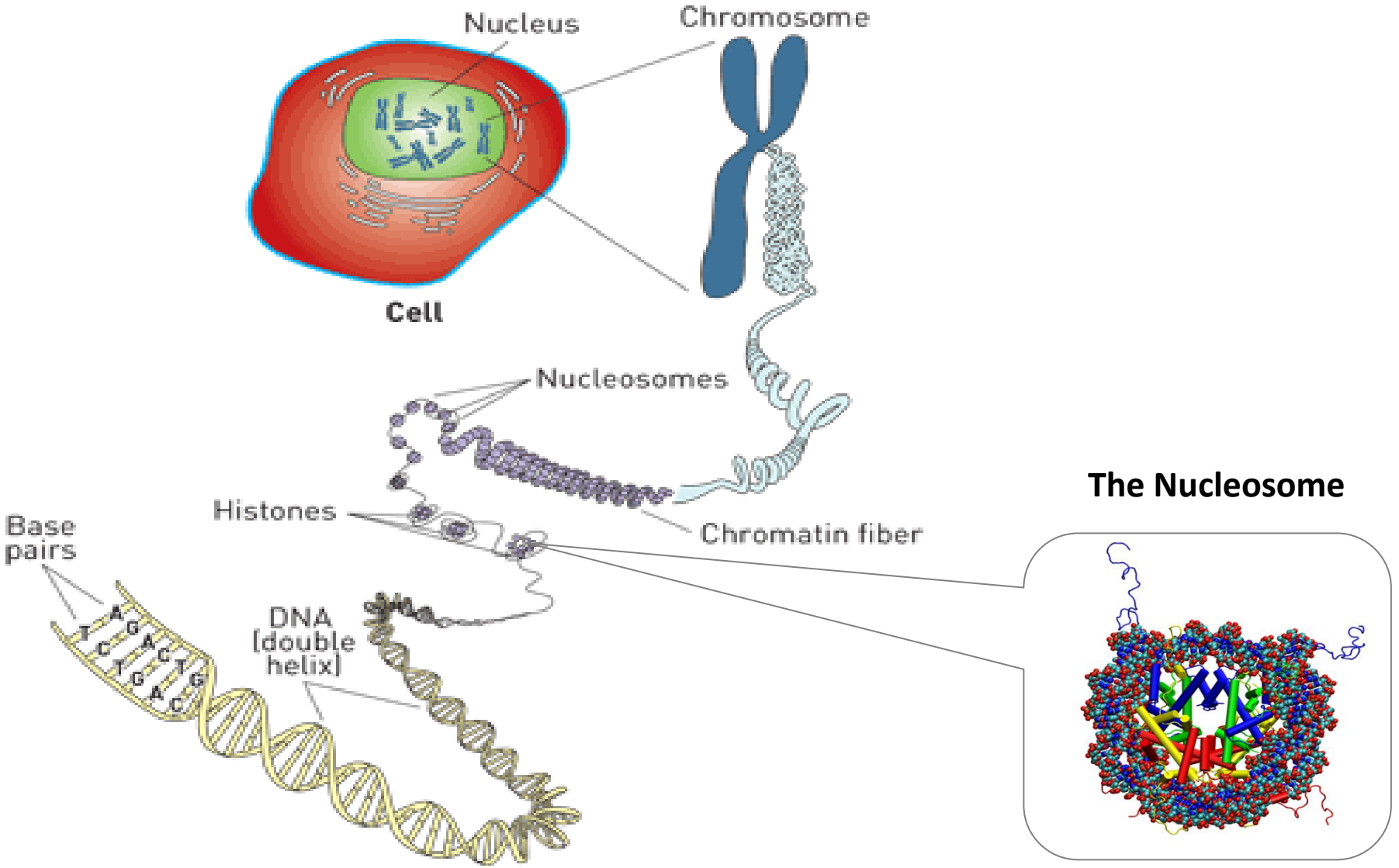
http://www.youtube.com/watch?feature=iv&annotation_id=annotation_998644&v=f6T0puoIr9g&src_vid=hnSPGlpZx_Q



Observation of irregular, kinky, and asymmetric tendencies in the molecular dynamics simulations of the nucleosome.

Thomas C. Bishop
LONI Associate Professor
Louisiana Tech University
Ruston, LA

Biology 101 and the Nucleosome

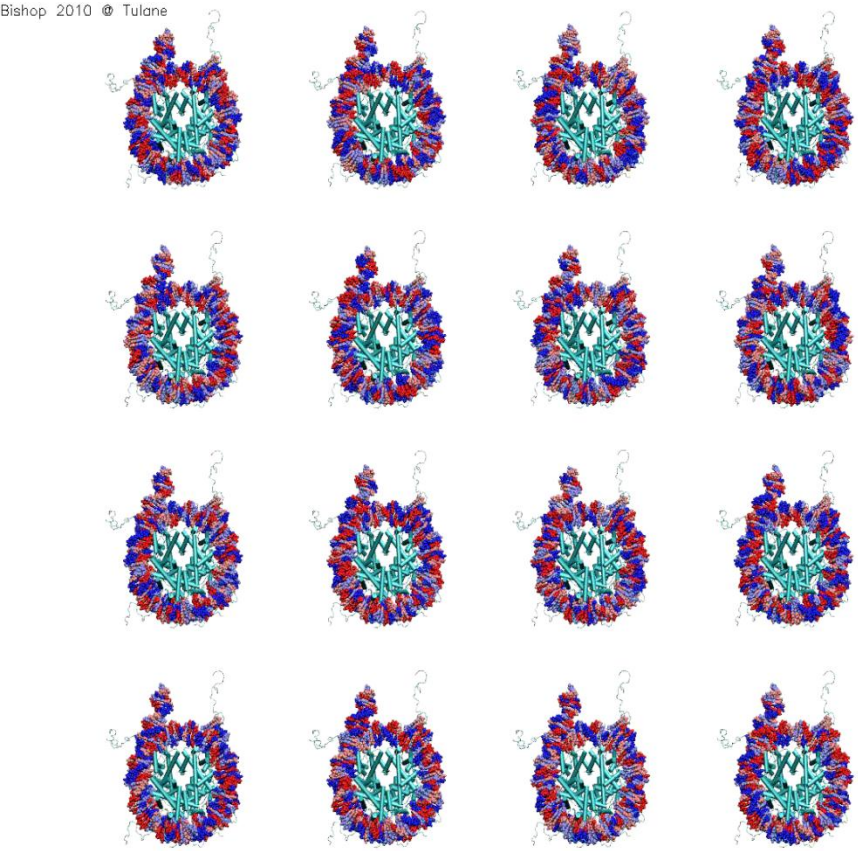


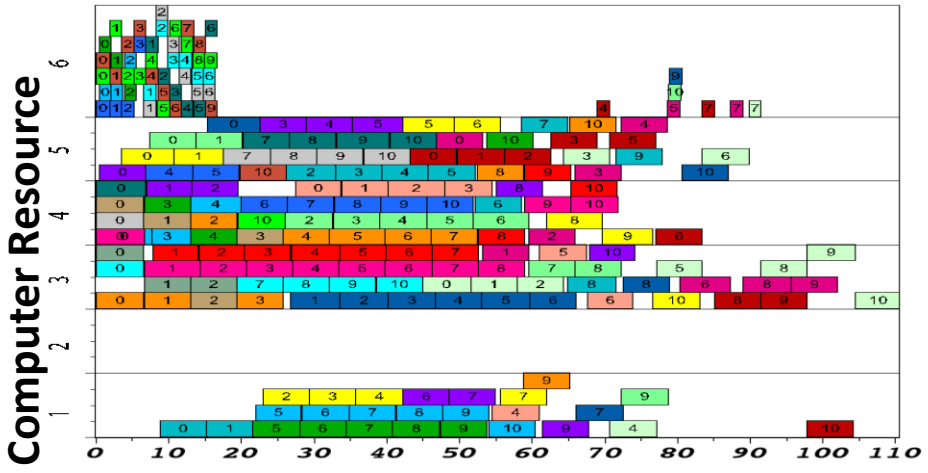
What in the world are the pictures and what was Dr Bishop talking about Monday?

- The first slide shows how DNA is folded by histone proteins into nucleosomes that clump together to from chromatin that then folds again and again ... ultimately forming the highly condensed "X" like the structure that folks often think of for chromosomes. However, for most of the cell cycle the genome is packed into chromatin, the fiber like structure containing just nucleosomes.

-

Many Nucleosomes = Many Simulations





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Explanation of Bishop's Research Con't

- So what is Dr Bishop's research is all about? He studies nucleosomes in silico (on the computer) and can look at about 16 nucleosomes at one time on the computer in atomic detail... Each simulation of a nucleosome takes **128** computers working together (like brick layers working on a house) about 8-10hrs of time to simulate 1 nanosecond (1 billionth of a second) in the life of a nucleosome. As you can image not a lot happens in 1 nanosecond. So he runs them typically for 20ns... Not a lot happens in 20ns but he hopes that this is sufficient to study the differences between nucleosomes that are made with diff. sequences of DNA.

  In short he use **A LOT** of computer time to study a few billionths of a second in the life of several hundred nucleosomes. since we know the position of every atom in our simulations we can obtain a very detailed investigation of how the individual atoms in DNA behave and affect the structure and
  dynamics of DNA, nucleosomes and chromatin.

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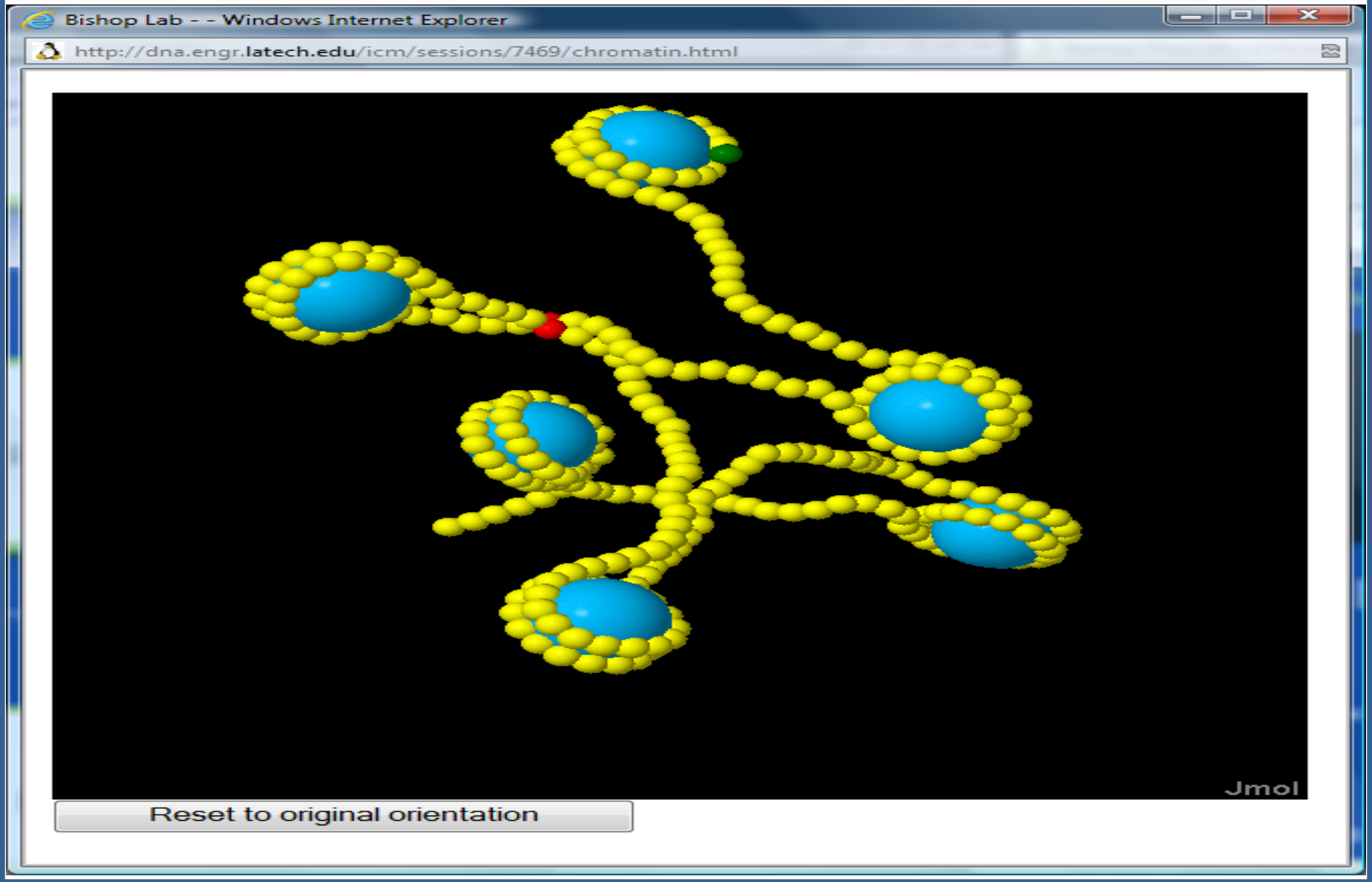
Interactive Chromatin Folding



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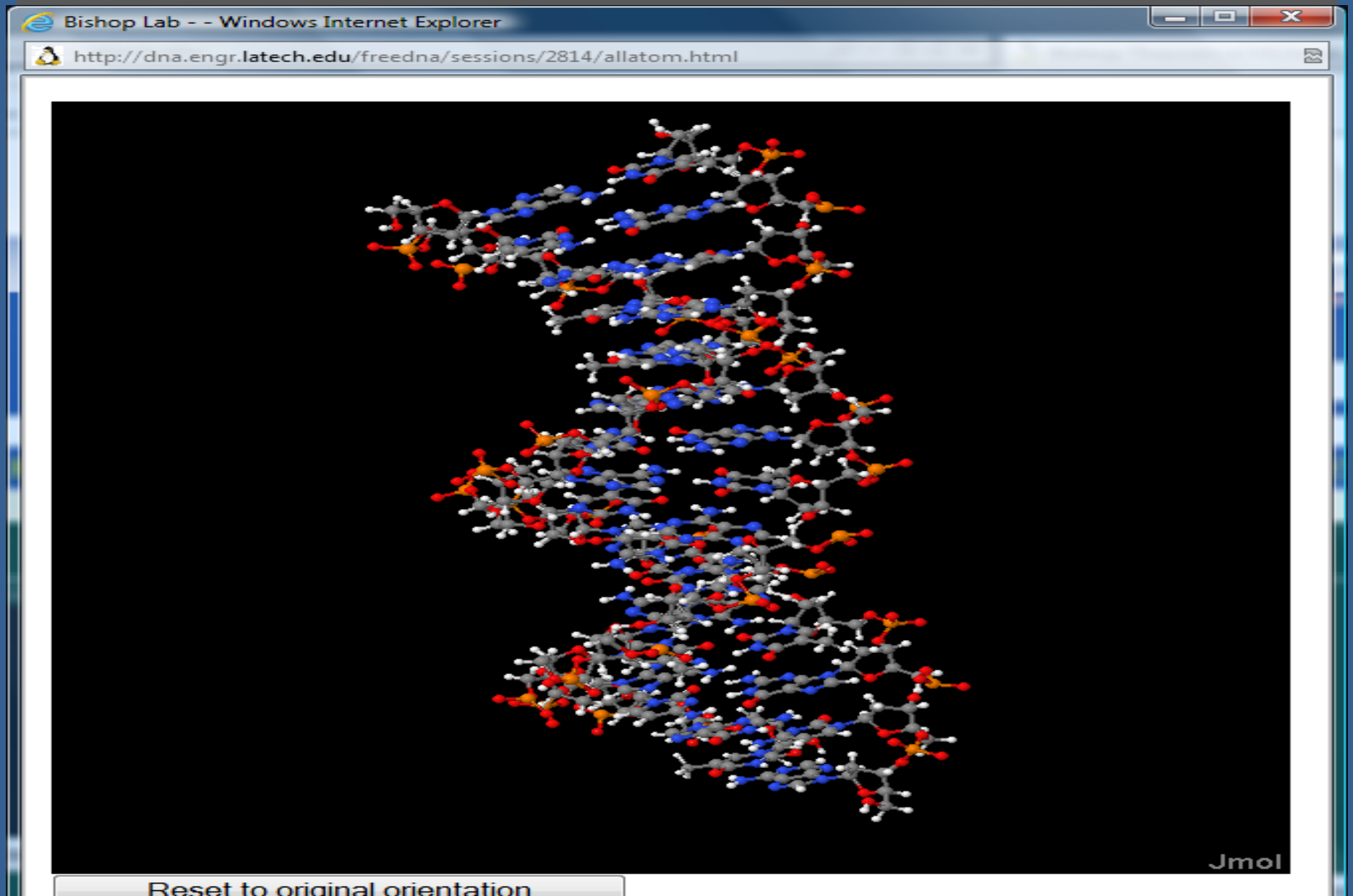
Interactive DNA Maker



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http://www.transportation.anl.gov/

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Press Coverage

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http://www.pbs.org/wgbh/nova/tech/

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http://www.scienceofeverydaylife.com/teachers/nine-to-twelve.cfm

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9-12 Lessons

GRADES 9-12 **Keeping our Food Safe – Rapid Detection of Contamination Using Bioassays**
This lesson addresses the scientific dimensions of food safety, the types of bacterial organisms and pathogens that contaminate our food, and the modern technologies that enable us to detect them before they get a chance to infect us.

PDF Download activity

GRADES 9-12 **Taking the Energy Challenge**
Population growth and an increase in energy demands require us to find new sources of renewable energy that we can use alongside our traditional fossil fuels in order to keep up with growing energy demands in the future. In this lesson, students will explore the physical science of energy, different types of energy, and the technologies that we use for our power supplies.

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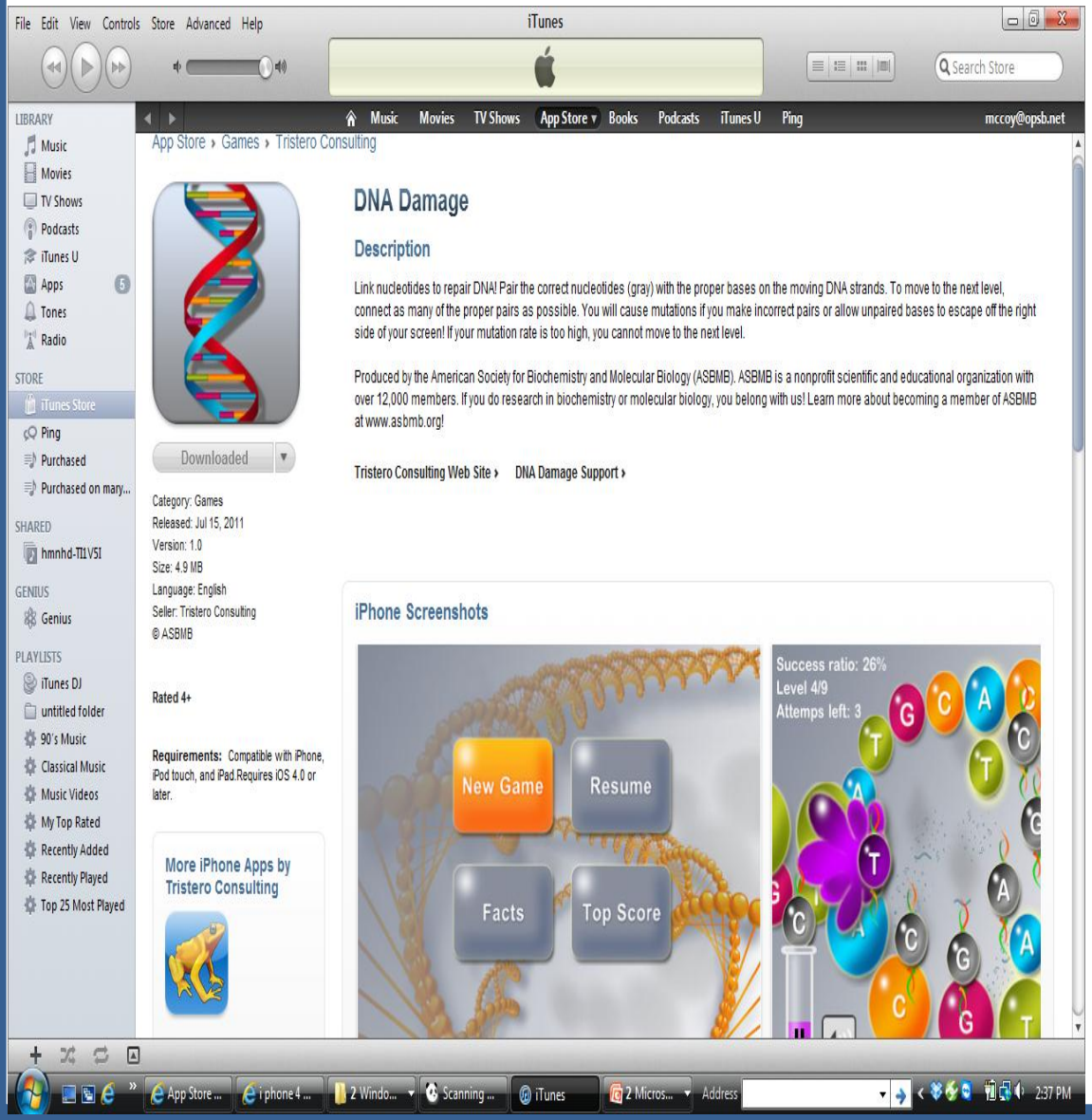
What do all students love to use for entertainment?



This free iPhone game is called ***DNA Damage*** allows the player to pair nucleotides with the proper bases, link nucleotides to repair DNA, connect as many base pairs as possible. If you make incorrect pairs or your mutation rate is too high, you cannot move to the next level.

Produced by the American Society for Biochemistry& Molecular Biology (ASBMB)

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http://learn.genetics.utah.edu/content/begin/tour/index.html

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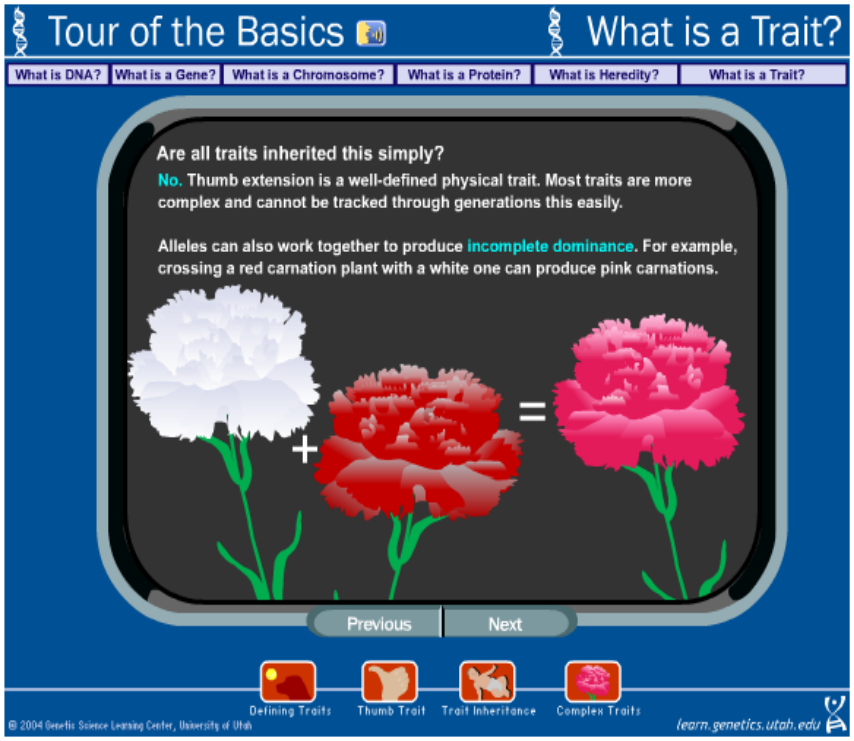
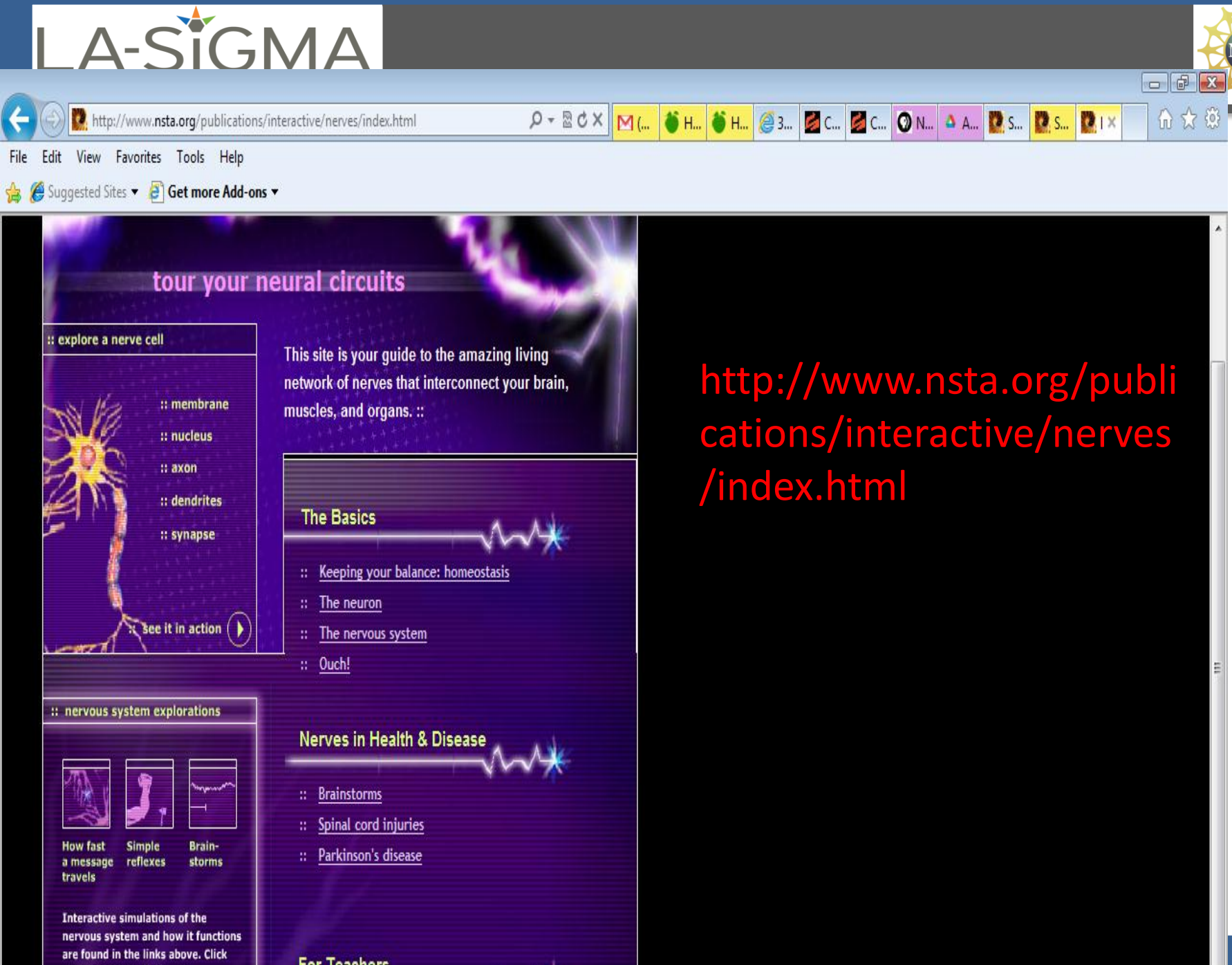
TOUR OF THE BASICS



You can also download the Tour, in either a Windows or Mac version, directly to your computer so that you can run it whenever you want, without an Internet connection.



http://www.nsta.org/publications/interactive/nerves/index.html

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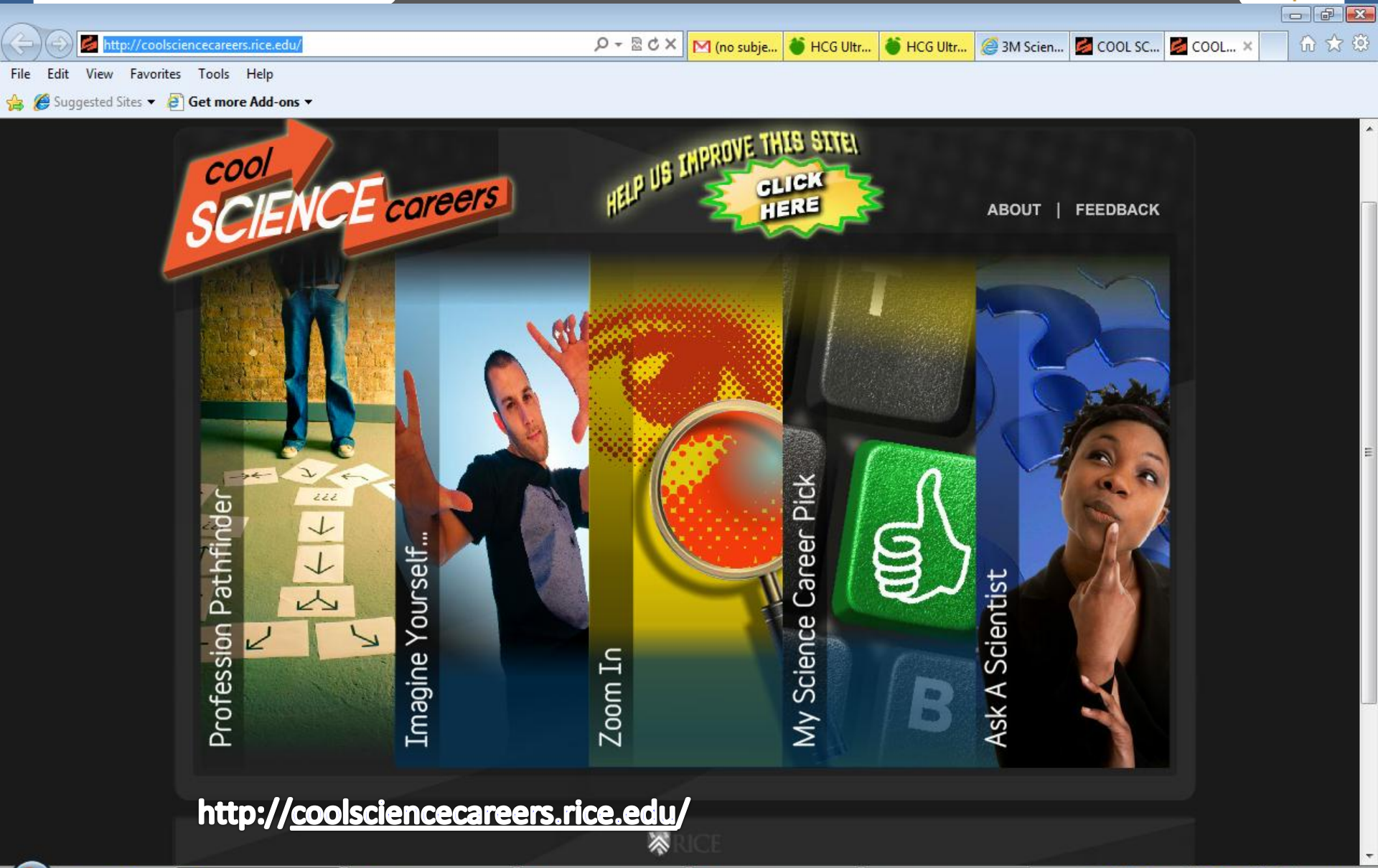
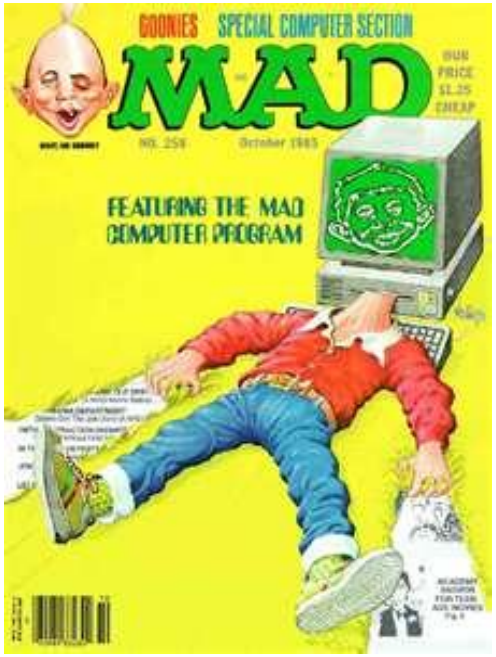


Modeling and Simulation 101 - YouTube.url

What IS Computer Programming?

http://www.youtube.com/watch?v=qHOBC9DYFJA&feature=related



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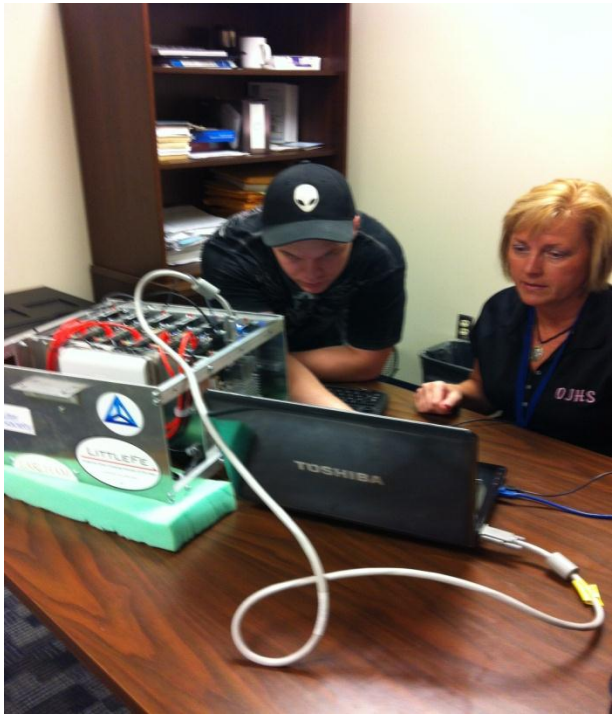
The End or Is It?

A special thanks goes out to Tom Bishop, Ramu Ramachandran, Alicia Boudraux, Dr Upaili, Collin Wick, Weizhong Dai, Yuri Lvov, Jim Spaulding, Dr Murray, LA-SiGMA, NSF, LA Tech, all the RET teachers, Graduate students, REU students, and our own students who worked to make this project such a success!!



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