NSTA WEB SEMINARS

LIVE INTERACTIVE LEARNING @ YOUR DESKTOP

NSDL/NSTA Web Seminar:

Computational Biology

NSDL
THE NATIONAL SCIENCE DIGITAL LIBRARY

Tuesday, December 11, 2007

6:30 p.m. - 8:00 p.m. Eastern time

Agenda:

1. Introductions

2. Tech-help info

3. Web Seminar tools

4. Presentation

5. Evaluation

6. Chat with the presenter

http://nsdl.org

Supporting the NSDL Presenting Team are…

For additional Tech-help call:
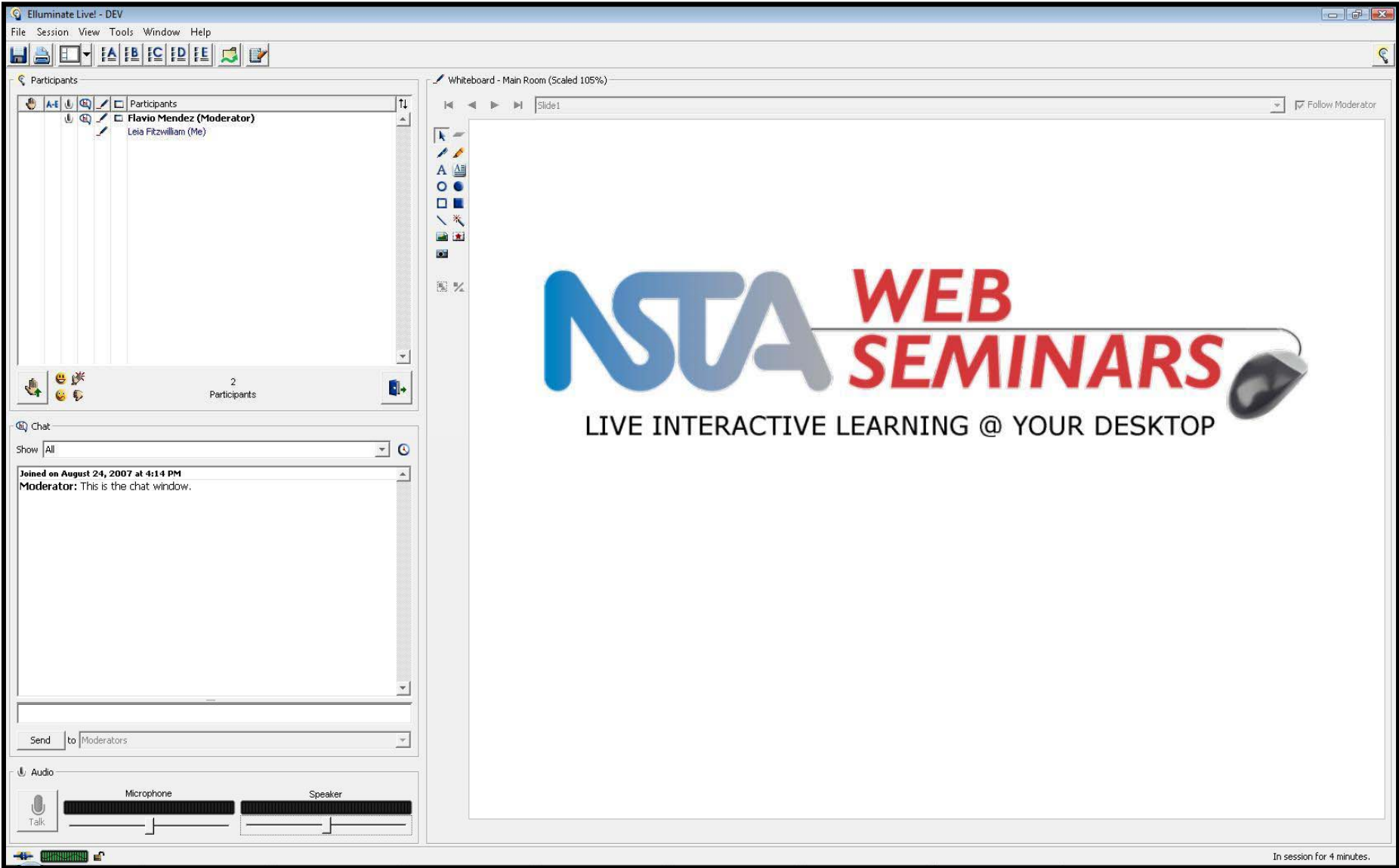
Elluminate Support,

1-866-388-8674 (Option 2)

Jeff Layman
Tech Support, NSTA
jlayman@nsta.org
703-312-9384

http://nsdl.org

Screenshot

We would like to know more about you…

How many web seminars have you attended?

Elluminate Live! - DEV

File Session View Tools Window Help

A B C D E

Participants

						Name
						Flavio Mendez (Mod...
						Leia (Me)

3
Participants

Use the letters A-E located at the top left of your actual screen to answer the poll
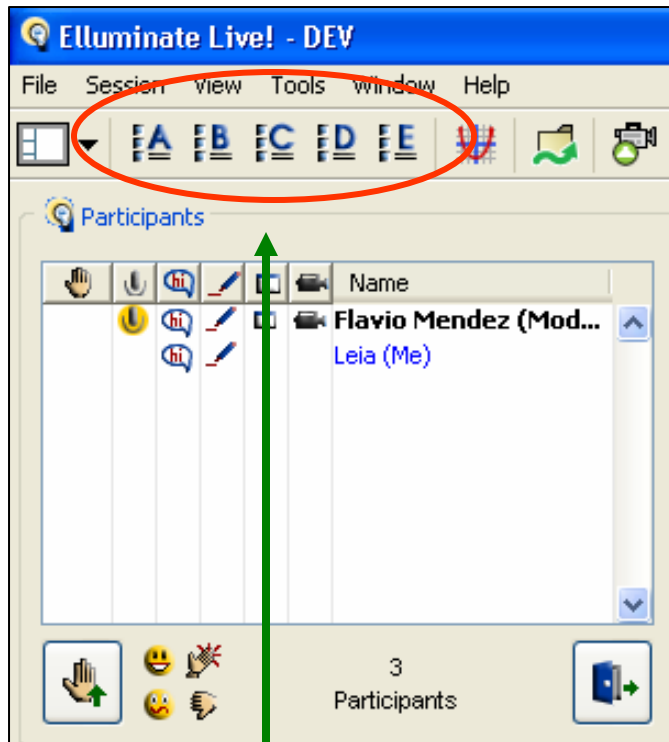
A. 1-3

B. 4-5

C. More than 5

D. More than 10

E. This is my first web seminar

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Where are you now?
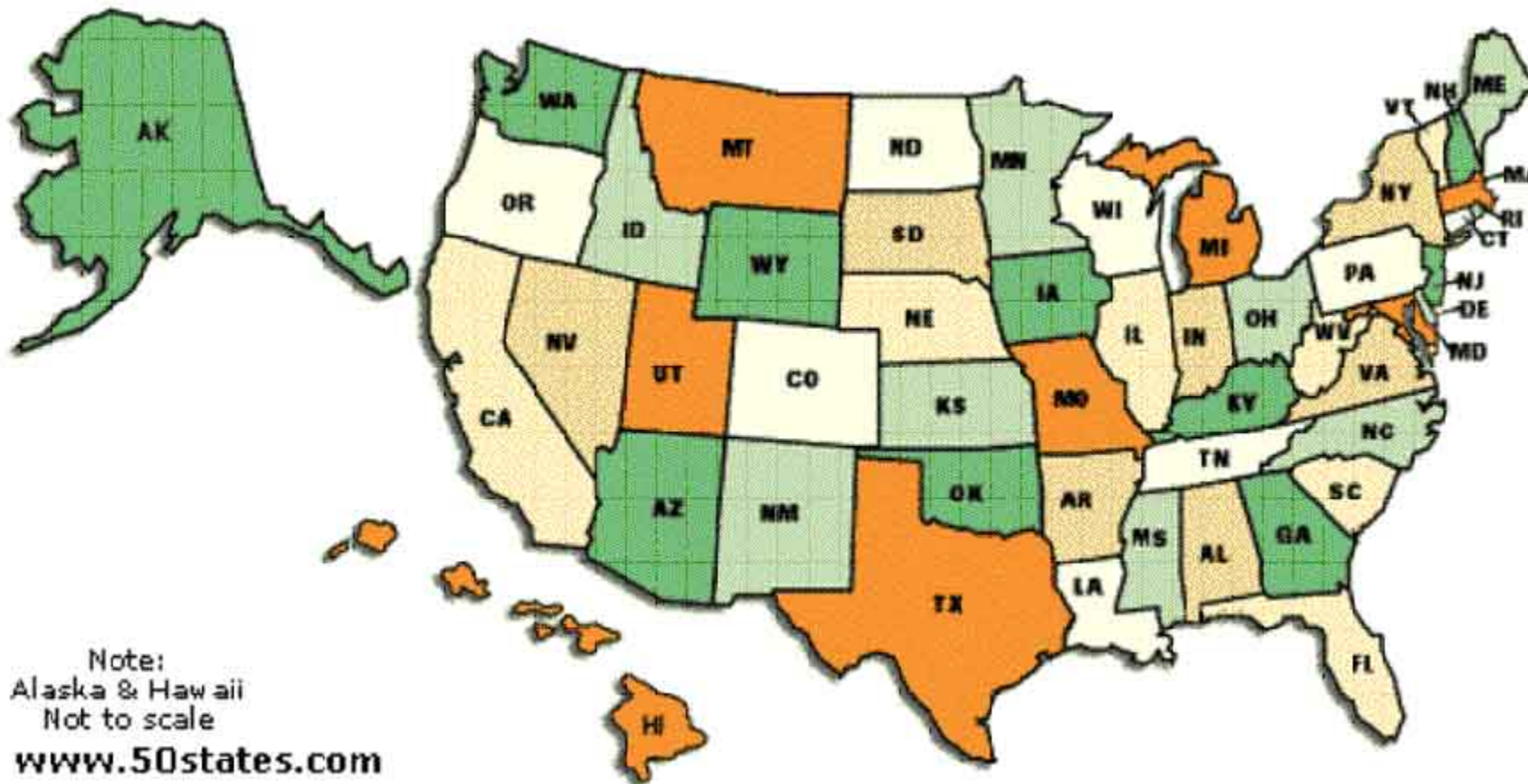
Note:
Alaska & Hawaii
Not to scale
www.50states.com

What grade level do you teach?

A. Elementary School, K-5.

B. Middle School, 6-8.

C. High School, 9-12.

D. I teach undergrad and/or grad students.

E. I am an Informal Educator.

NSDL/NSTA Web Seminar:

Computational Biology

Tuesday, December 11, 2007

Today's NSDL Expert:

Dr. Jeff Krause
Staff Computational Biologist and Educator
Shodor Foundation, Inc

Agenda

- **Introduction**

- **Background on contemporary (computational) biology**

- **Protein structure and molecular motion**

- **Protein networks and systems biology**

- **Tools for teaching system thinking**

Stamp all the categories that apply to you. I teach….

Biology	Math	General Science
Computation/ Programming	None of these	

Introduction:
My Neuro-Computational Perspective
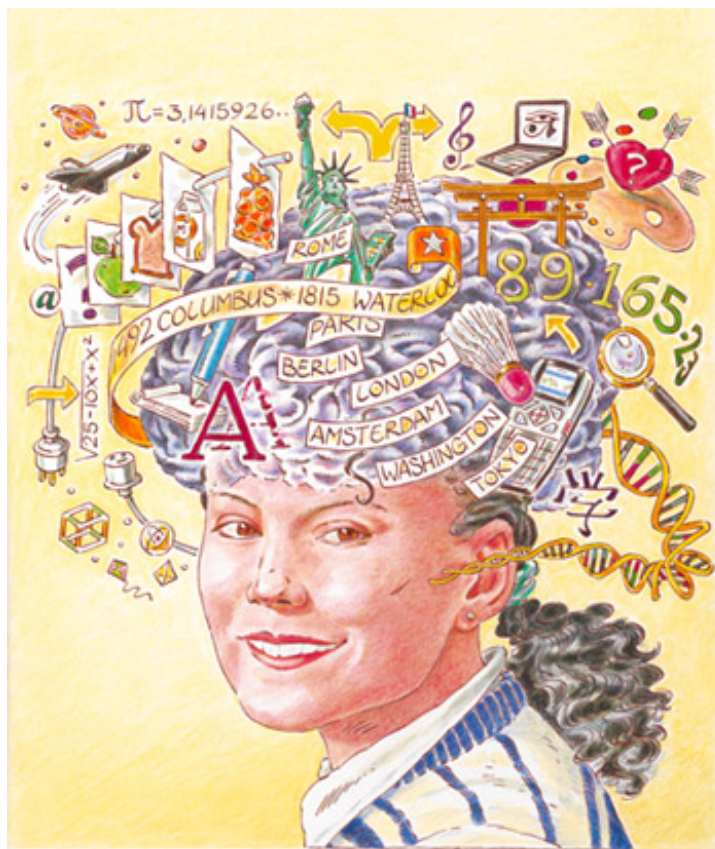
Introduction:
My Neuro-Computational Perspective
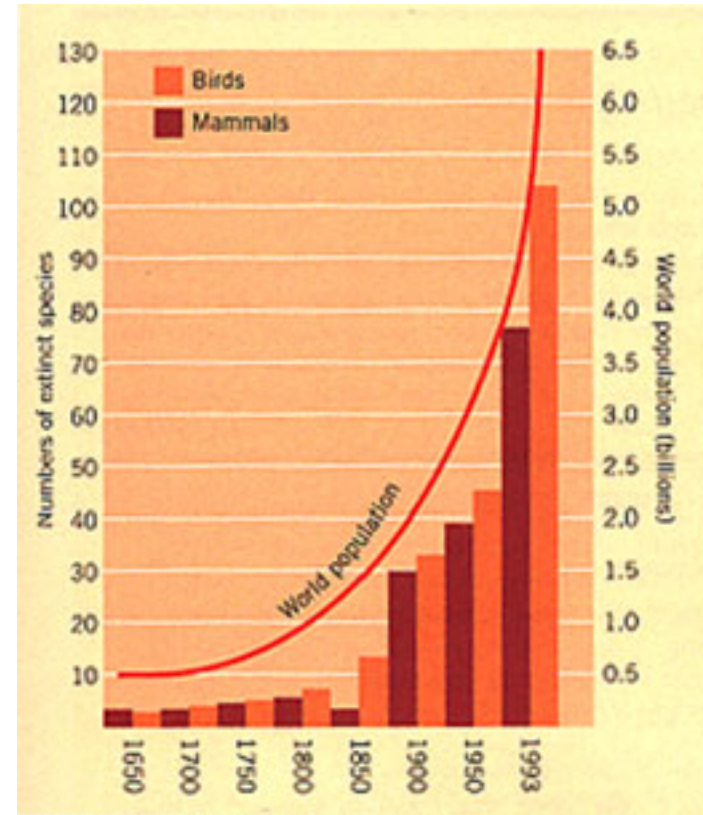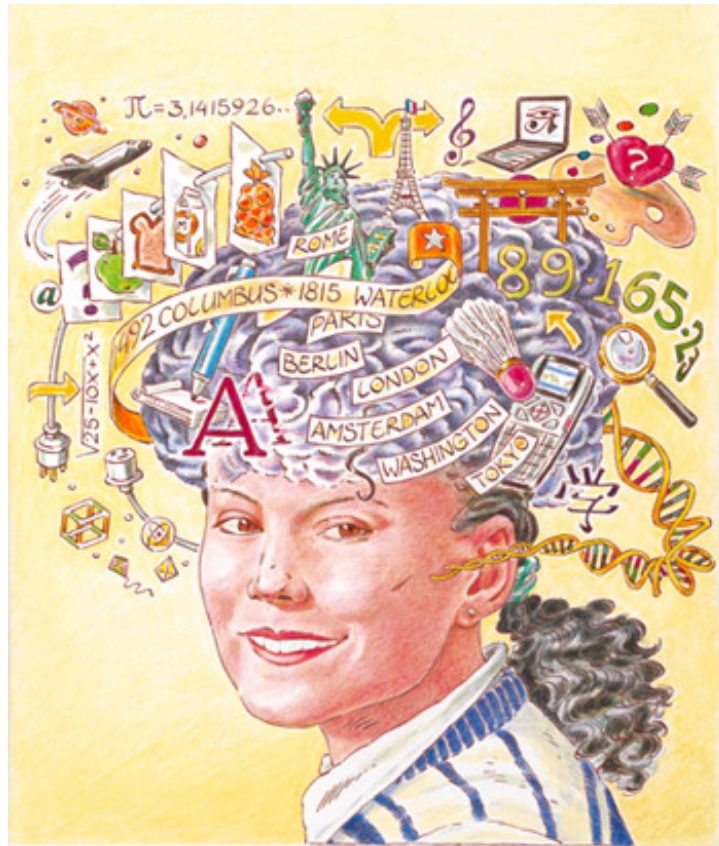
Source: Dr. Richard A. Bradley,
Associate Professor, Biology, Ohio State University

Introduction:
My Neuro-Computational Perspective

Introduction:
My Neuro-Computational Perspective
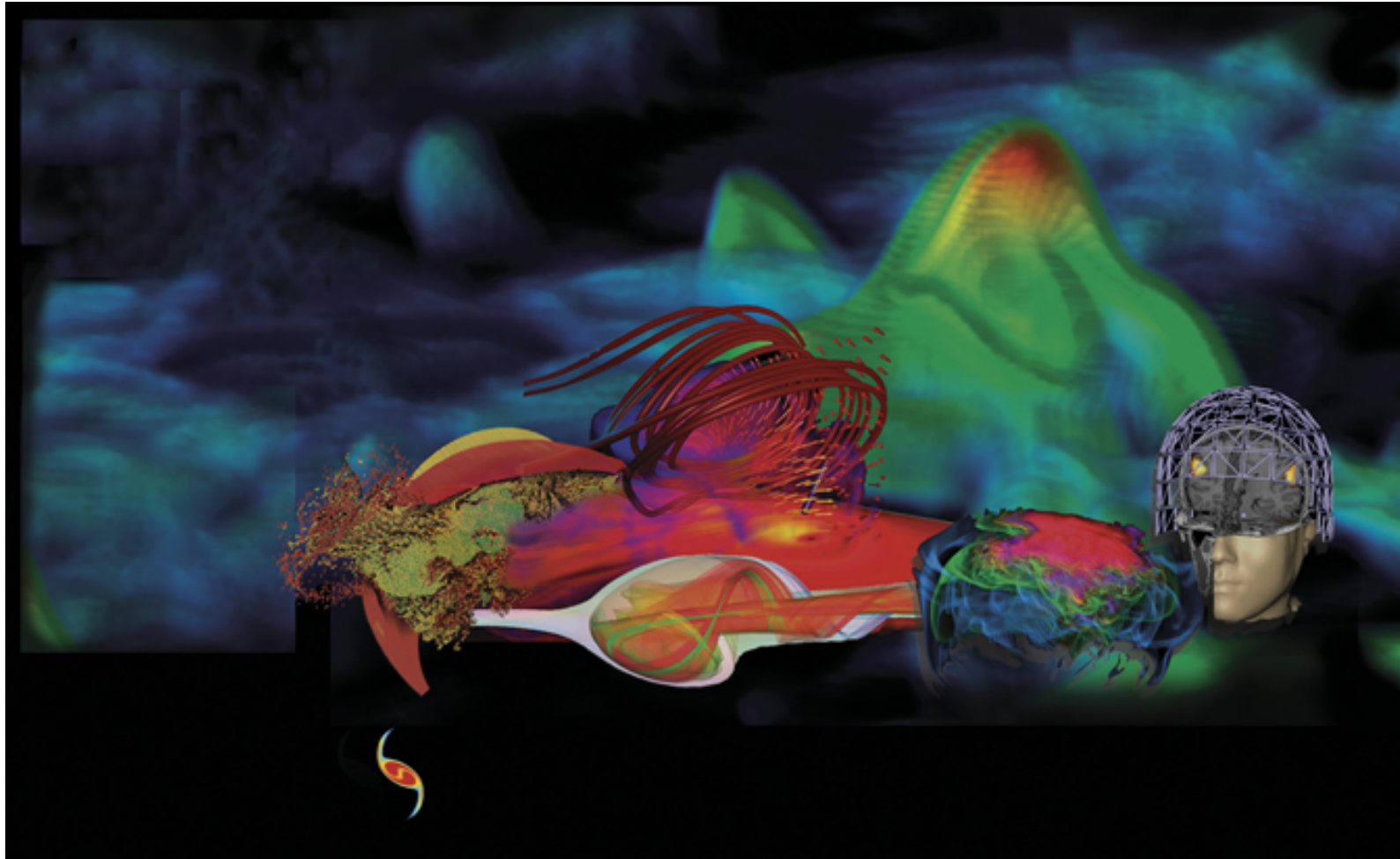
Contemporary Biology: A short history

Biology as a "hard" science
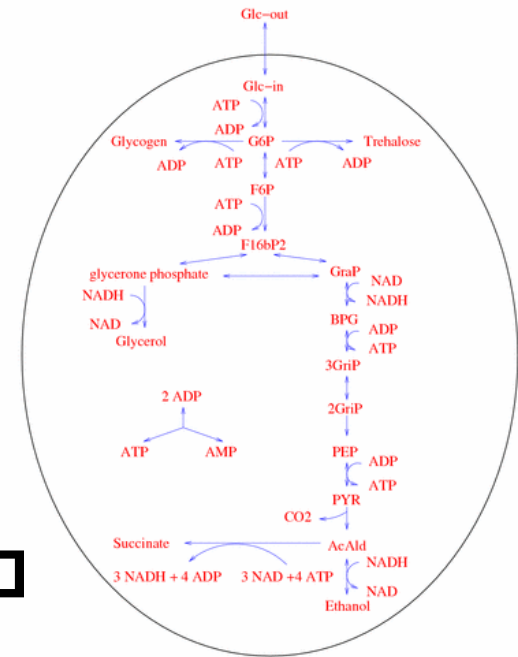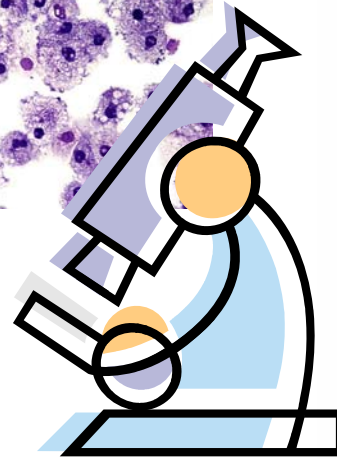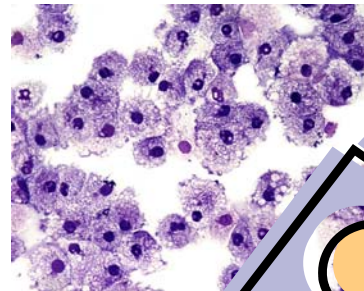
Use reductionism to deal with biological complexity

Contemporary Biology: A short history
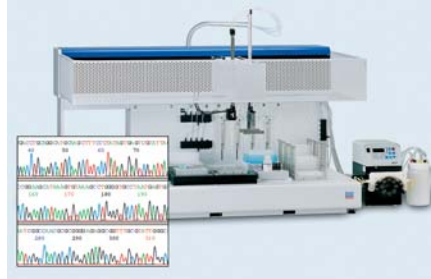
High-throughput biomolecular measurement technologies and the "genomic revolution"

Contemporary Biology: A short history
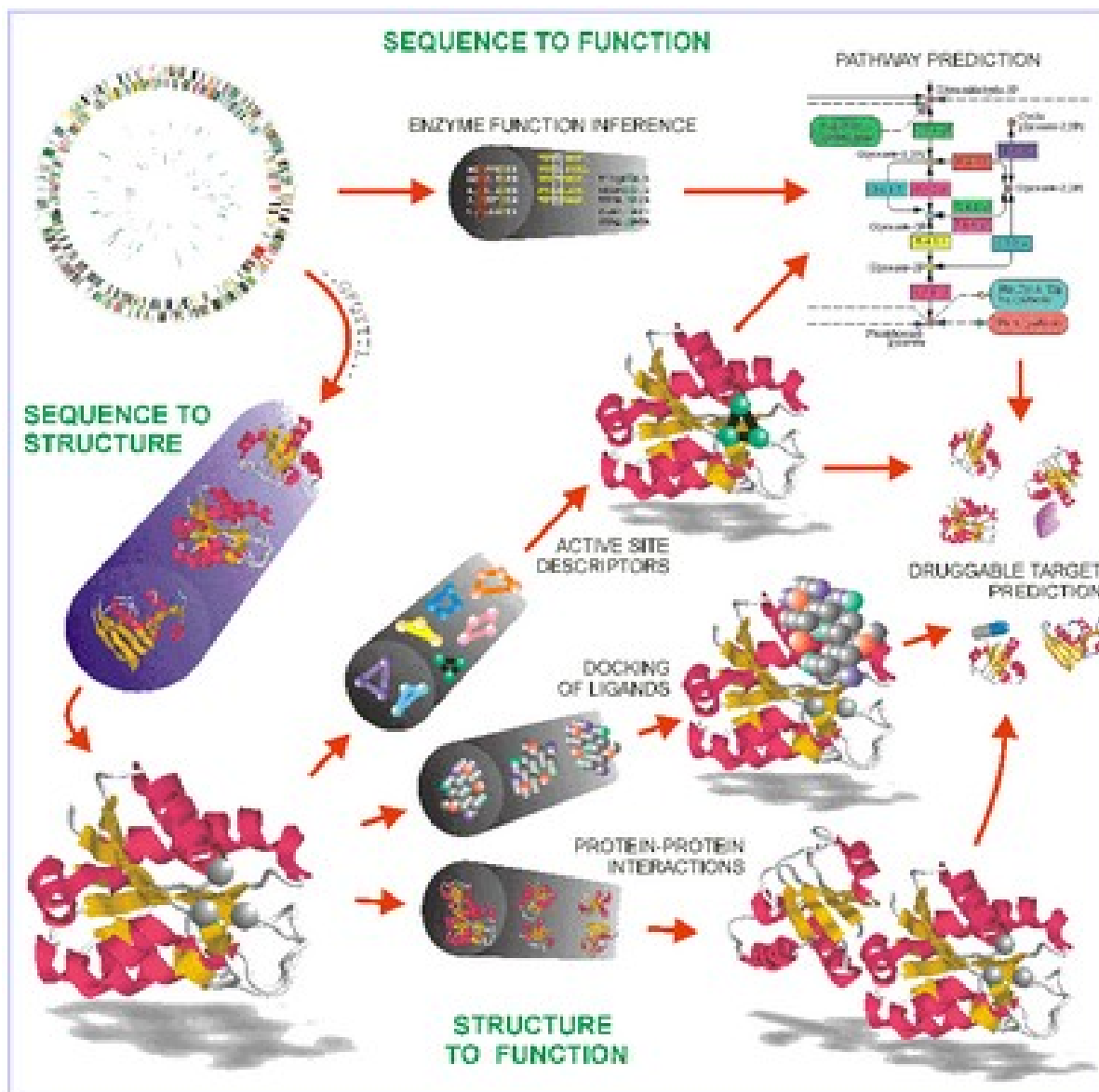
The molecular world is unintuitive to most students (and teachers). How does the molecular world differ from our everyday experience?

Write your ideas on the chat
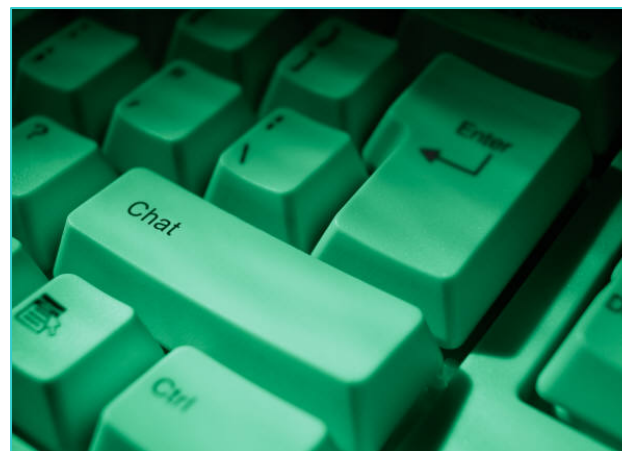
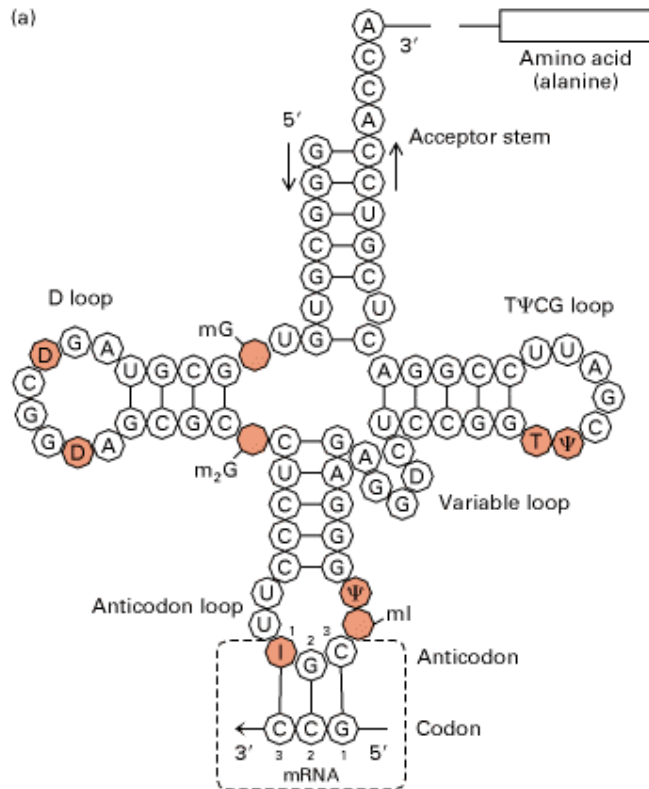# The Molecular Literacy Project
http://molit.concord.org

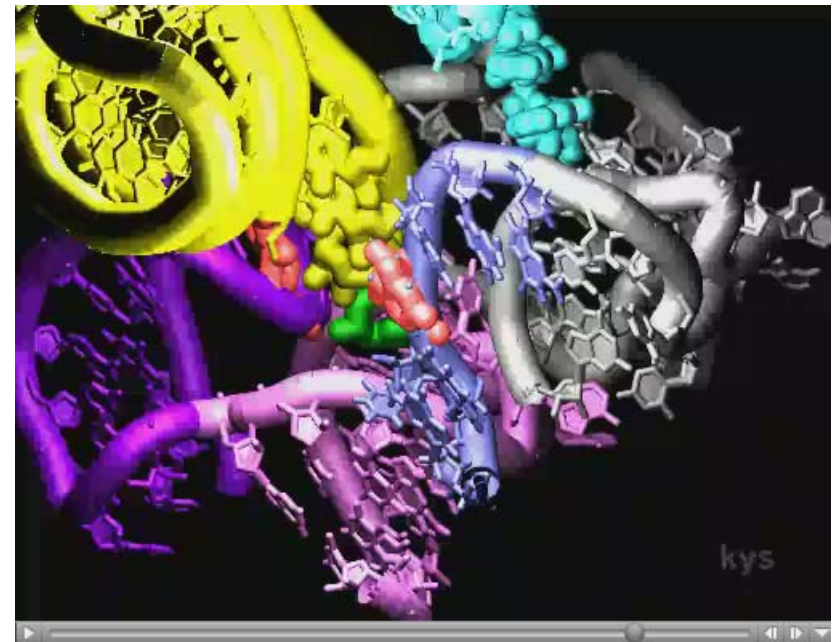# Seeing Real Protein Structure, Function and Dynamics

Typical textbook molecular structure

Molecular dynamics simulation

The Protein Data Bank
http://www.rcsb.org/pdb

Additional Collections for Protein Structure and Dynamics….

Go to the NSDL K-12 page resource list for this seminar

http://nsdl.org/resources_for/k12_teachers

VMD: Visual Molecular Dynamics

http://ks.uiuc.edu/research/vmd

How many of you have seen or used any of these tools before?

A. I haven't seen or used them before

B. I knew about some of them as research resources

   but not educational resources

C. I have used them in class to positive effect

D. I have used them in class but they weren't helpful

An Example: Calcium-Induced Structural Change in Calmodulin
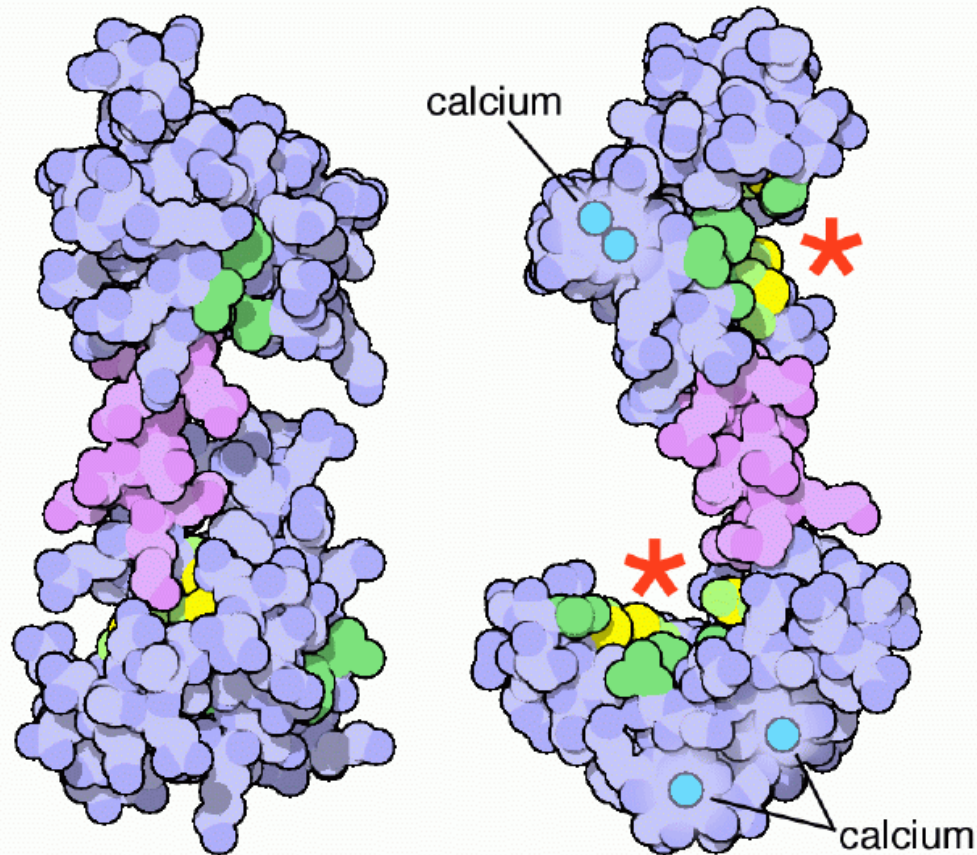
calcium

calcium

Calmodulin was PDB Molecule of the Month for August 2003

Calmodulin is a molecular switch:

- If <u>no calcium</u>
  - Then keep sticky spots closed

- Else, <u>calcium binds</u>
  - Then open up the sticky spots

An Example: Calcium-Induced Structural Change in Calmodulin
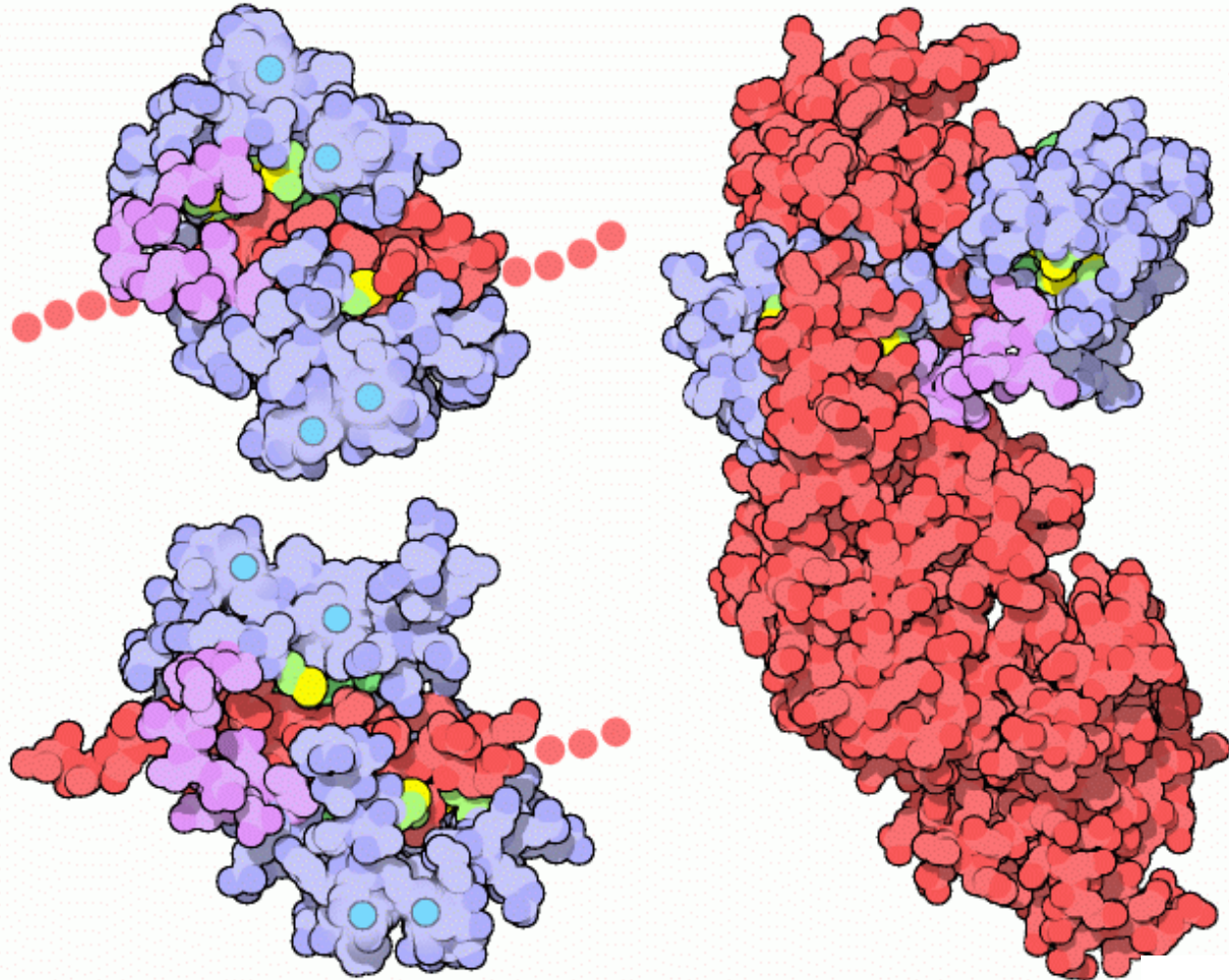
One Role of CaM at the Synapse

NMDA Antagonist

Ca^{2+} Ca^{2+} Ca^{2+}

Ca^{2+} ↑

CaM

(+) ERK 1/2

Ca^{2+}/CaM

(+) CaMKK

Nucleus

(P) (P)

(+) CREB (+)

(+) CaMKIV

Aktivierung antiapoptotischer Gene
(Wachstumsfaktoren, *bcl-2*)
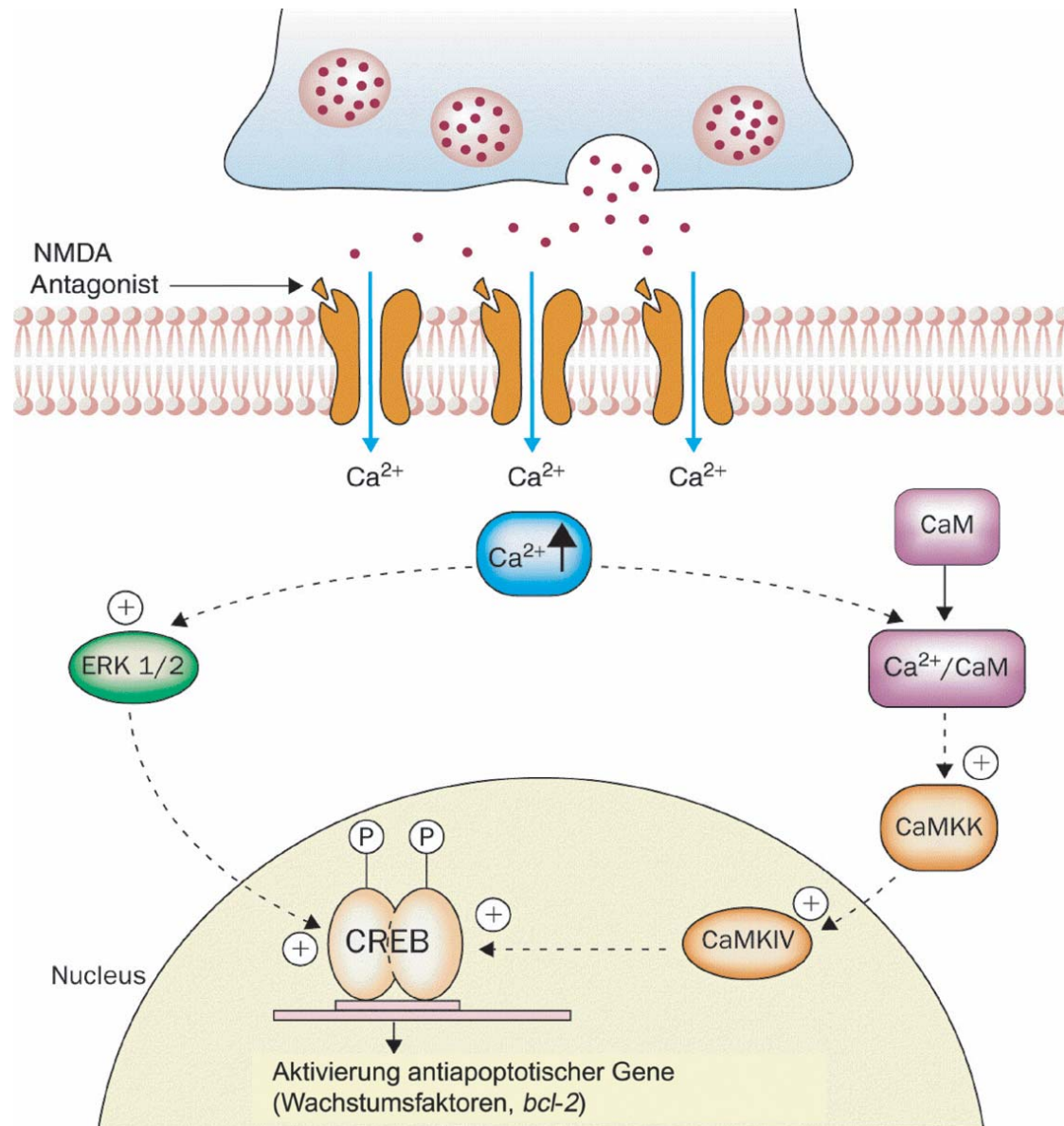
How many calmodulin binding proteins can you name? Stamp your answer:

More than 20	More than 5
At least 1	zzzzzz

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Some of the CaM Targets in the Cell

Some Calmodulin Binding Proteins with their Locations & Functions
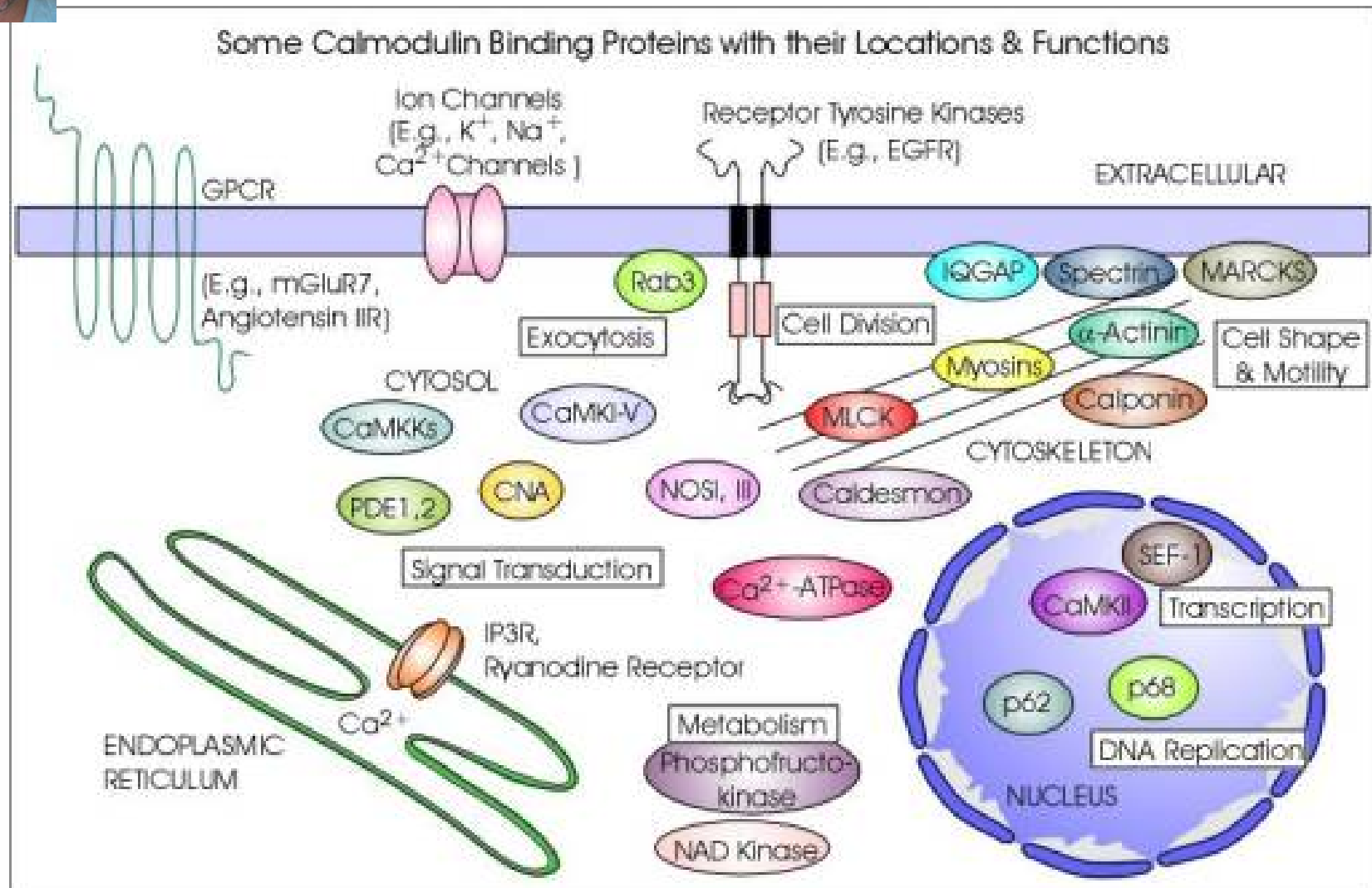
From Parts Lists to Systems-Level Understanding

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BIOLOGY REVISION

ARSE

ELBOW

Srizelda

Two tasks:

1. System identification

2. Behavior analysis

How do the parts go together to make the functional system?

Additional Collections for Major Systems Biology Resources on the Web and Standards Movements in Systems Biology …

Go to the NSDL K-12 page resource list for this seminar
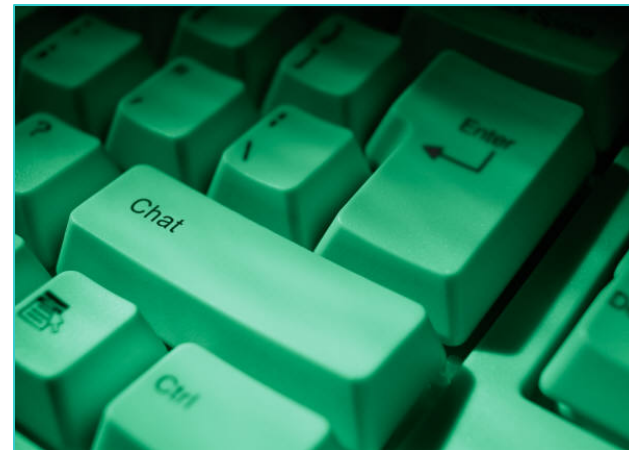
http://nsdl.org/resources_for/k12_teachers

Which of the following is not one of the "Big 3" cellular networks?

Cell division	metabolic
signaling	gene-regulatory

How Big is the Task of Systems Biology?

How should we prepare students to contribute to, or at least understand post-genomic biology?
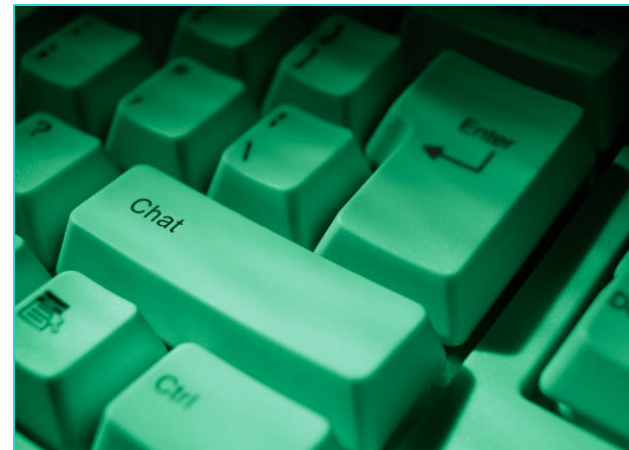
Write your ideas on the chat

Have any of you mentioned systems biology in class? If so, what activities or lessons did you conduct on the topic?
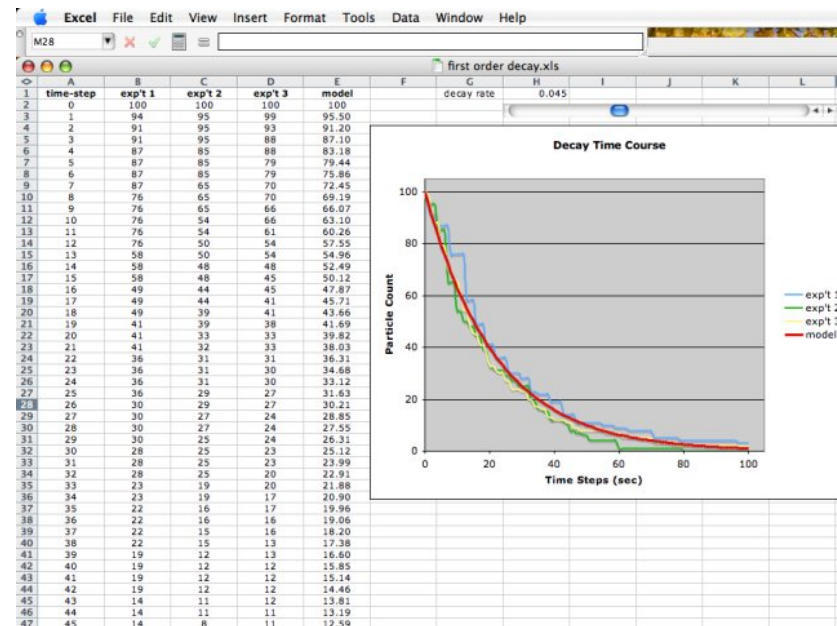
Write your responses on the chat

Under Development at Shodor: Dynamic Modeling Workbench

http://www.shodor.org/~jeffk/dynModWB.html (temporary site)

- **Analyze** time-course data from a virtual experiment

- **Diagram** the system using data

- **Build** a system diagram (Vensim model)

- **Run** the simulation

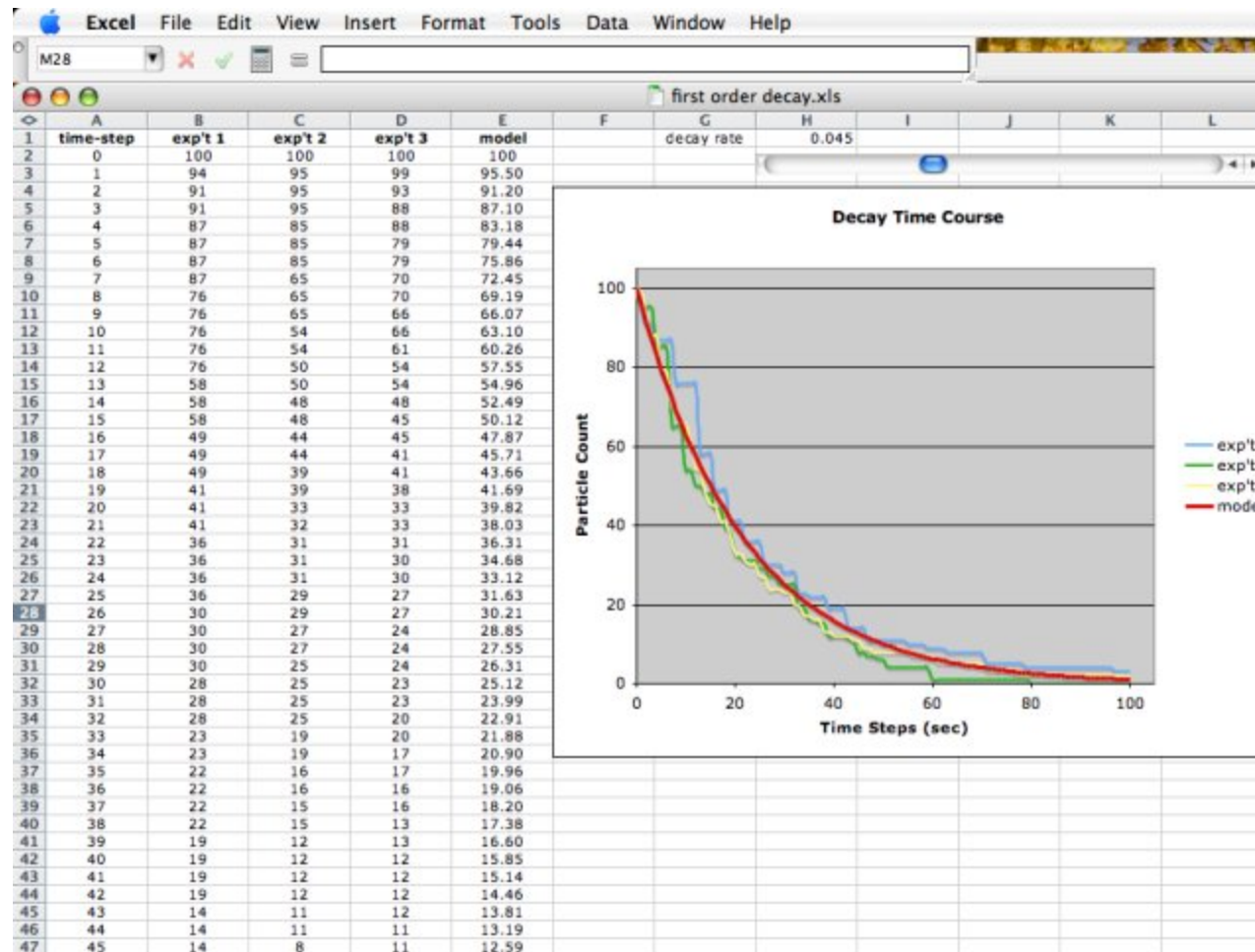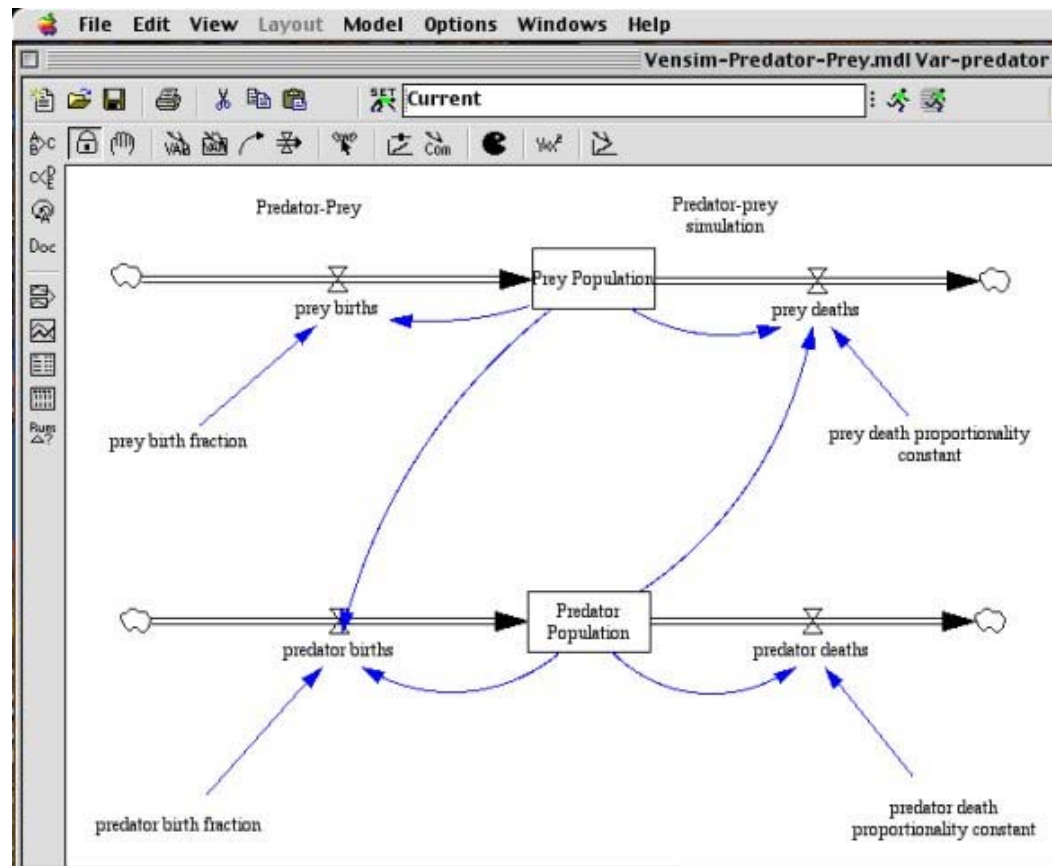- **Compare** results to time-course data

Step 1: Analyze Time-Course Data from a Virtual Experiment in Excel
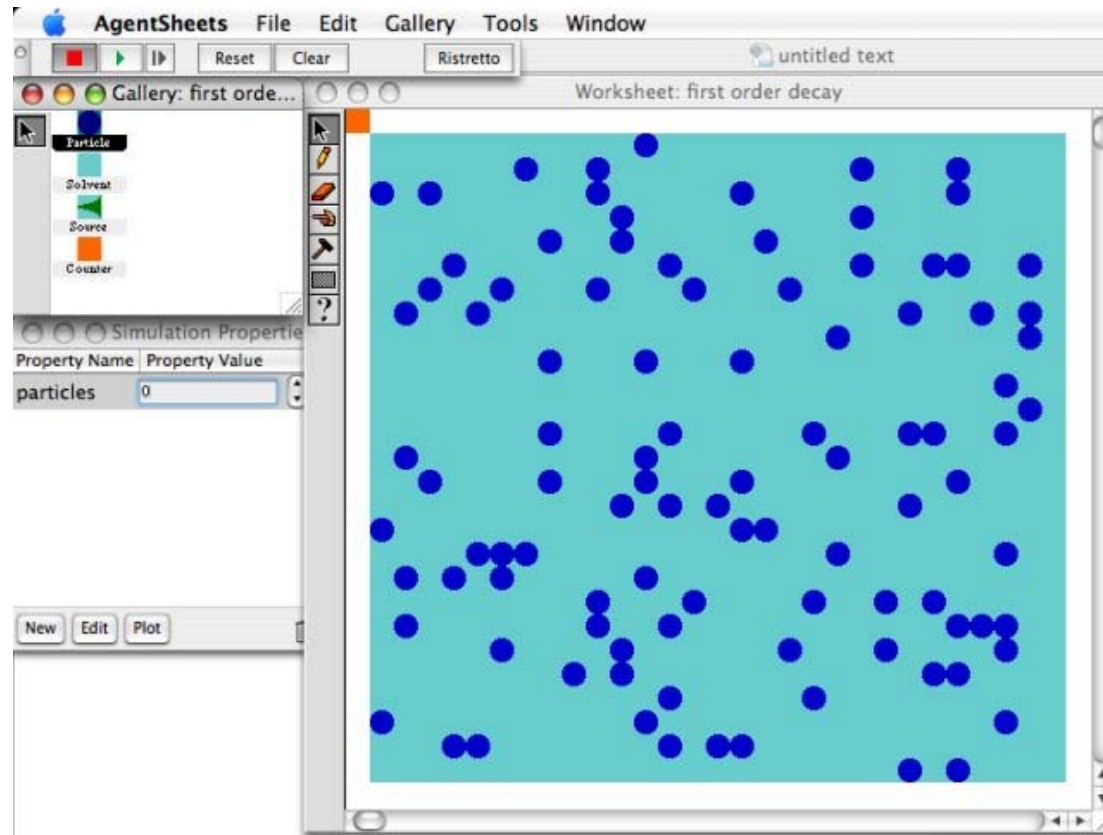
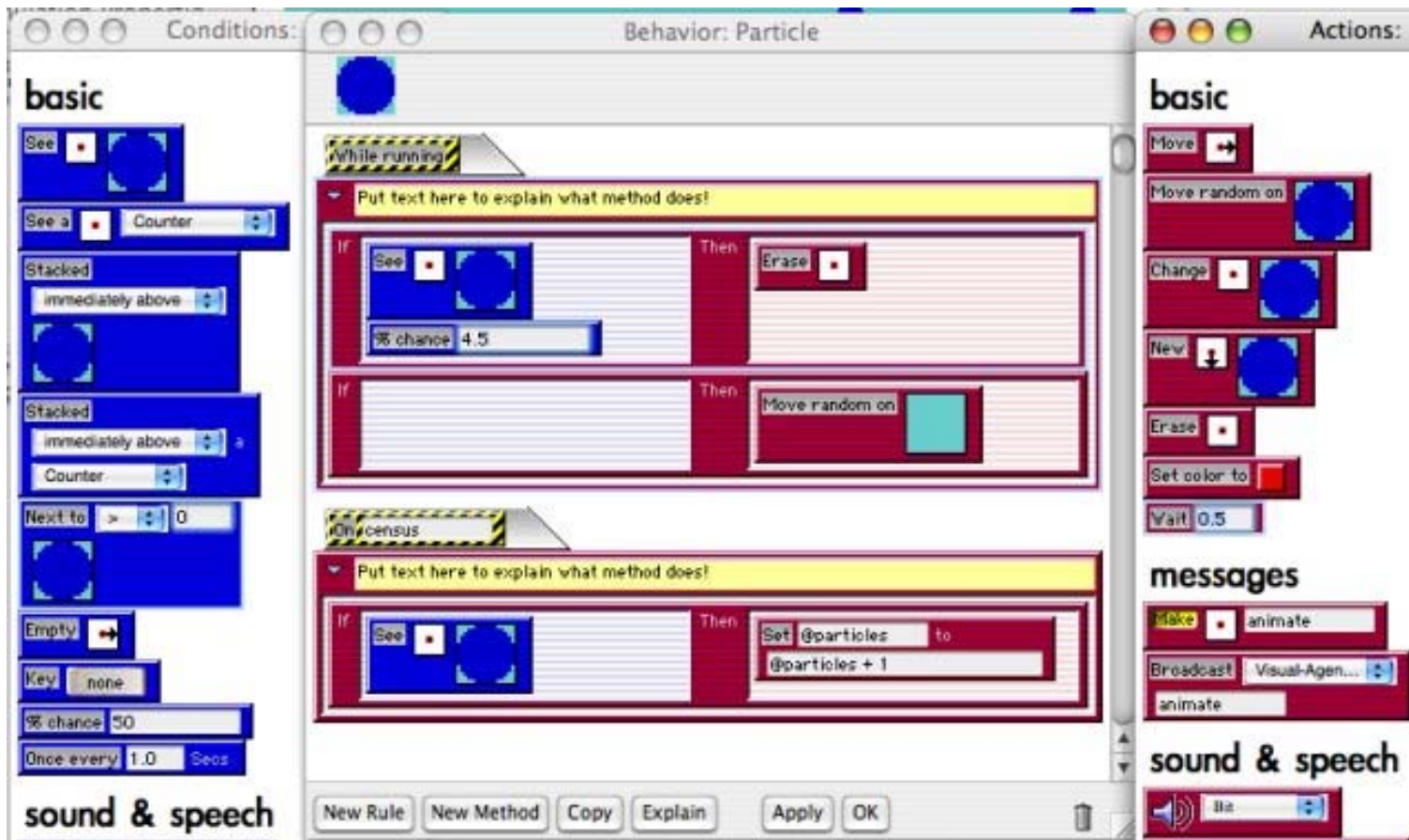# Step 2: Diagram the System, and Create and Run a Vensim Model

Step 3: Explore and modify the original Agent-Based Model that was used to produce the data

Agent Sheets allows model building with a graphical interface, but...

Shodor is always looking to work with passionate educators!

Dr. Jeff Krause
jeff.krause@shodor.org

THANK YOU!

http://www.shodor.org

http://www.cserd.nsdl.org

Go to http://nsdl.org and click on the K-12 audience page to:

- Download our Seminar Resource List
- Utilize our blog featuring our presenters for the Fall Series sharing their insights on careers in science and science education:

http://expertvoices.nsdl.org/2007fall-nsta-sems/

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http://www.elluminate.com

http://learningcenter.nsta.org

National Science Teachers Association

Gerry Wheeler, Executive Director

Frank Owens, Associate Executive Director
Conferences and Programs

Al Byers, Assistant Executive Director e-Learning

NSTA Web Seminars

Flavio Mendez, Director

Danielle Troiano, Project Coordinator

Jeff Layman, Technical Coordinator

- *<u>NASA: Successful Strategies for Involving Parents in Education</u>*

December 12, 2007

- *<u>IPY: The Role of Polar Regions in Earth's Changing Climate System</u>*

December 13, 2007

http://learningcenter.nsta.org