

SMART Teams

Students **M**odeling **A** Research **T**opic

2010 NSLS/CFN Users' Meeting

Tim Herman
Milwaukee School of Engineering



The magic of models.....



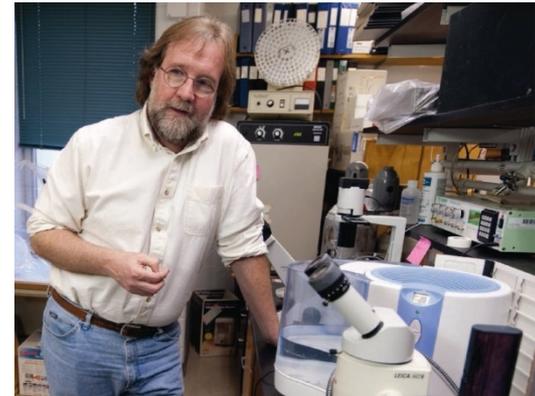
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K12 Science Outreach

An interview with Sean Carroll --- newly appointed VP for science education at HHMI.

Question: *What has been your most rewarding science education experience?*

Answer: *I think the most rewarding for me has been contact with (high school) teachers. I think they are a really important and valuable constituency.*



Science, April 16, 2010



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The 3D Translation Team



The first-ever physical models
of the ribosome...based on
atomic coordinates.



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SMART Teams

Students **M**odeling **A** Research **T**opic

A minimally-invasive, cost-effective way to introduce students to the research.

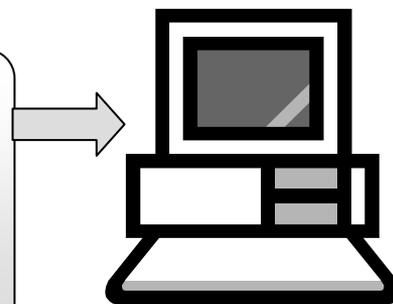
Teams of high school students work with a local research lab to create a physical model of a protein that is being investigated in the lab.



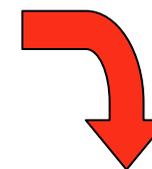
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Protein Models...in 4 Easy Steps

Any image that can be created in the computer environment of RasMol,...



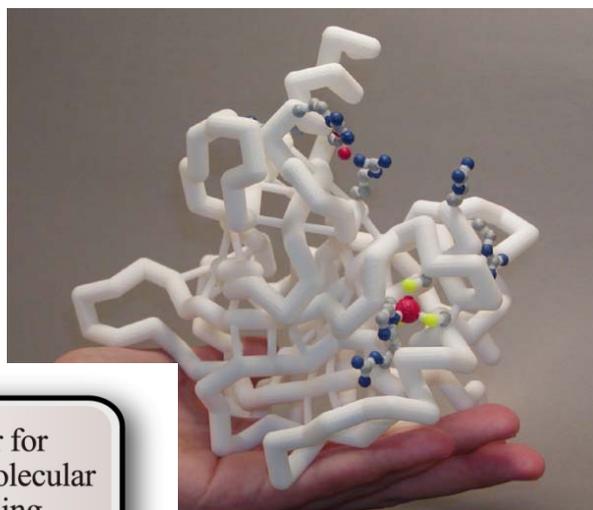
RP-RasMol



Ply/Stl file

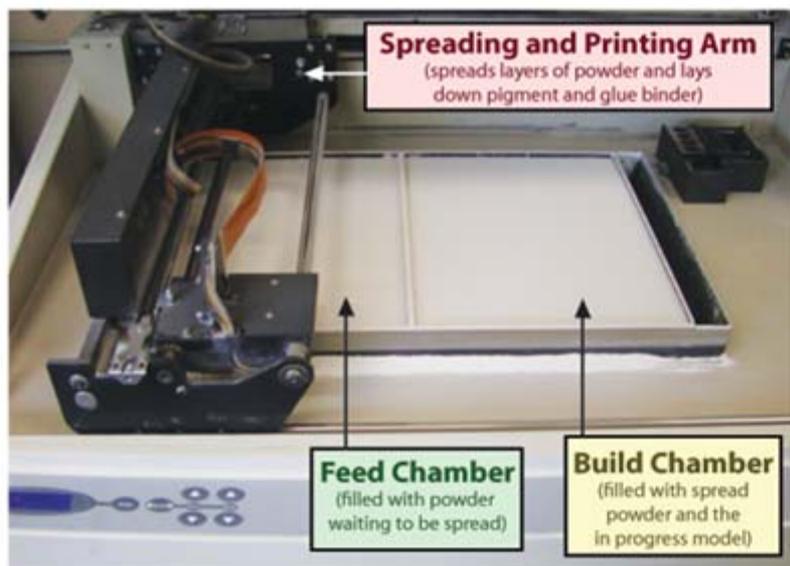


... can now be converted to a physical model by rapid prototyping.



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3D Printing Technology



Team Anthrax ... our first SMART Team

Three high school seniors created models of the three proteins involved in anthrax pathogenesis.

- Protective Antigen
- Lethal Factor
- Edema Factor**

** BEFORE the work was published.



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SMART Teams Start with Teachers

Summer Workshops ...



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SMART Teams Work for Everyone

For Teachers...

For Students ...

For Researchers...

For Schools...

For Science Outreach Programs...



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The **Three Phases** of the SMART Team Program



Publication

Telling the Story

A Poster

A Presentation

Attending Research Meetings.



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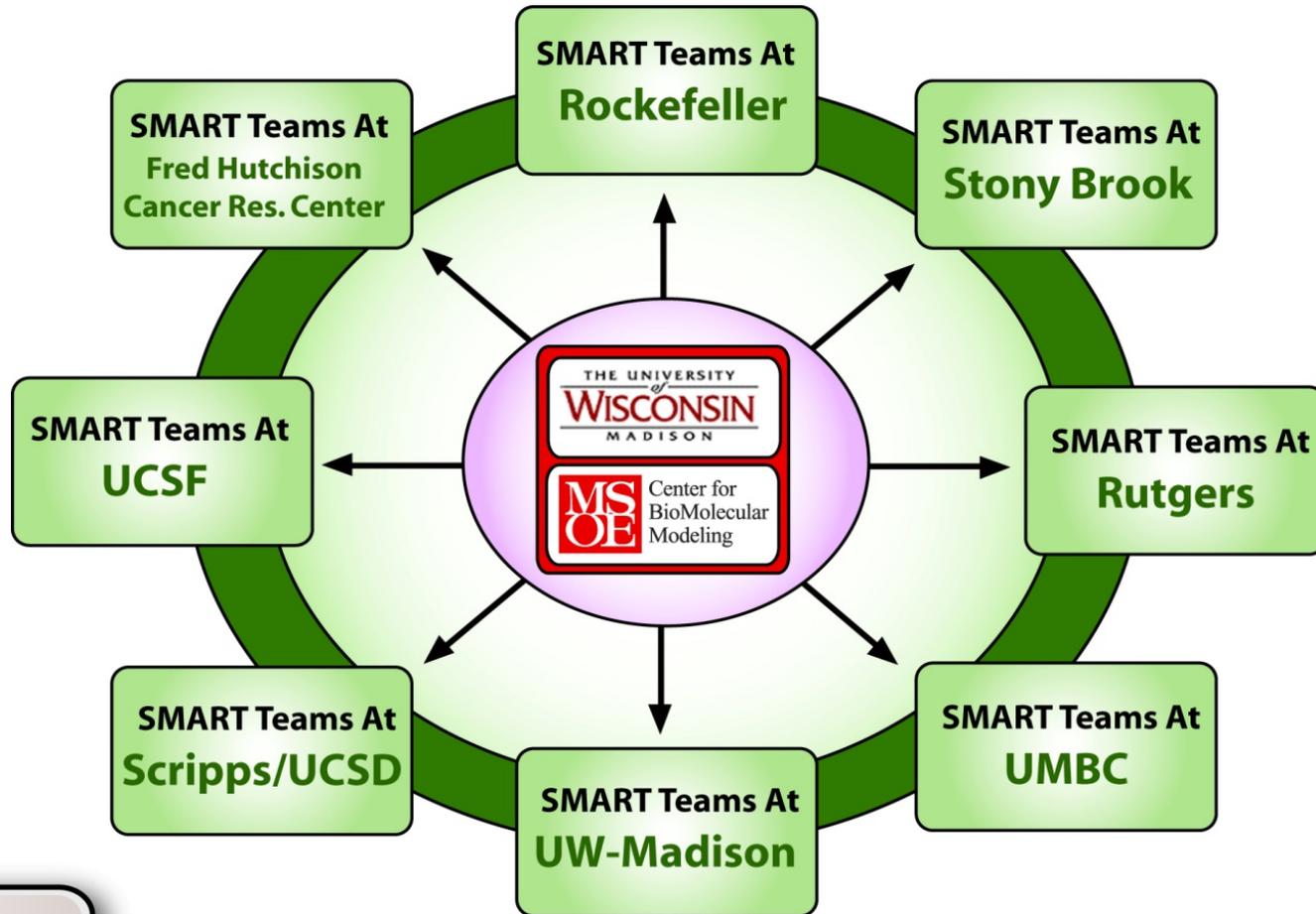
The Pingry SMART Team

www.mybiology.com



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Disseminating SMART Teams



Doing Science

...in your head

and / or

...at the bench

“As long as kids are moving fluids, they think they are doing science.”



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Doing Science

This I believe...

...that a SMART Team modeling experience is a minimally-invasive, cost-effective way to introduce teams of students to “the real world of science” ...

...without pipetting.



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But how do we know that?

Once the Team understands the story of the protein, we encourage them to explore:

Who did What? Experiment...

... that resulted in some data...

... that was interpreted to support the story that we tell with the model.

A model is more than a model...

A physical model becomes
an embodiment of the process of science...

...whereby the story of the protein was pieced together by

... multiple people

... in multiple labs

*... performing multiple
experiments*

...that collectively support the major plot of the story.





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