Application for 2008 S.M.A.R.T. Team

In cooperation with the Center for Biomolecular Modeling
at The Milwaukee School of Engineering

Team Supervisors: Tommie Hata ('04, '06), Deirdre O'Mara ('05, '07)
Cooperating Scientists: Richard Ebright, Waksman Institute, Rutgers University, NJ ('04)
Fred Hughson, Dept of Molecular Biology, Princeton University, NJ ('05)
Seth Darst and the Darst Lab, The Rockefeller University, NY ('06)
Andrew Vershon, Waksman Institute, Rutgers University, NJ ('07)
Vincent Fischetti, The Rockefeller University, NY ('08)
Ann Stock, UMDNJ-Robert Wood Johnson Medical School, NJ ('09)

S.M.A.R.T. Teams (Students Modeling A Research Topic) are teams of high school students and their teacher working with research scientists to design and construct physical models of the proteins or other molecular structures that are being investigated in their laboratories. SMART Teams use state-of-the-art molecular design software and rapid prototyping technologies to produce these unique models. You can find out more about the Milwaukee School of Engineering, Center for Biomolecular Modeling, and SMART Teams at http://www.rpc.msoe.edu/cbm/.

The SMART Team program has three main goals:

- Learn to design and build physical models of a molecular structure using computer-assisted-design (CAD) software and state-of-the-art rapid prototyping technology.
- Experience *real science* as it exists in an active biomolecular research laboratory through interactions with scientists who are leaders in their field.
- Develop the skills necessary to communicate the accomplishments of your project to your peers, parents and the interested public.

You will have the opportunity to work with leading scientists in their filed and learn about their cutting-edge research. Their topics of study are often very specific; your goal is to be able to develop a physical model that effectively communicates the structural and functional significance of their research complex. You will have the opportunity to travel to present in front of scientists and educators at professional organizations. Past teams have traveled to the National Science Teacher Association National (NSTA) national convention, the American Crystallographic Association (ACA) annual meeting, and the American Society for Biochemistry and Molecular Biology (ASBMB) annual meetings. We plan on attending the 2009 ASBMB meeting in New Orleans (http://www.asbmb.org/asbmb/site.nsf/main/meetings) in April 2009.

How the program will run:

The project does NOT meet during a scheduled period. We will meet at the beginning of the Fall to schedule a single period that you will be available to meet each week. This can be a drop period or a free period; I don't mind if you change this week to week as long as you meet with the group once a week.

You will first learn to use RasMol to design physical models using PDB coordinate files. This is similar to the JMol tutorials that you might have seen before in Biology class.

We will meet with our cooperating scientist to learn about her research structure and its structural/functional significance. You will be given primary scientific journals to read to better understand the research complex. Back at school, you will each be assigned a specific aspect of the complex. Your task will be to use RasMol to design a model that successfully highlights its significance. These designs, or RasMol scripts, will be reviewed by our cooperating scientist. We might also be designing a web-based JMol tutorial to disseminate project details. See www.pingrysmartteam.com for the 2008 project.

Once our model designs are done and reviewed by our cooperating scientist, we will send the RasMol script files to our collaborators at the Center for Biomolecular Modeling to have the physical model built using rapid prototyping technology. We will then present the models along with a research poster at the ASBMB meeting (New Orleans) in April 2009. You will be responsible for travel expenses that have usually been around $800 a person.

How the application process will work:

The SMART Team is limited to approximately six to seven students. Selection will be based on demonstrated interest for the biological sciences, enthusiasm and dedication for the project, student's ability to commit the necessary time, and the academic capacity necessary to work with our cooperating scientist. **Apply ONLY if you are certain that you can and want to be an active and contributing member of the Team. Consider also your other extracurricular obligations and decide if you can make the necessary commitments to the S.M.A.R.T. Team project.**

The following are current Pingry students who were on past S.M.A.R.T. Teams. I encourage you to talk to one of them to discuss the program to make sure this is something you would enjoy and benefit from.

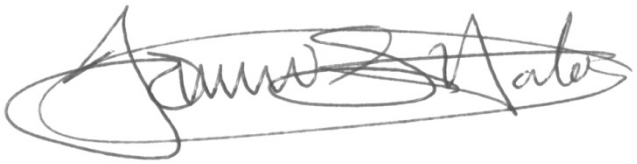
2008 S.M.A.R.T. Team
Jonathan Ciriello, Mac Cordrey, Danielle Cosentino, Calvin Jones, Becky Krakora, Bozhena Lisko, Yamini Nabar, Will Pinke, Neha Srivastava.

2007 S.M.A.R.T. Team
Brooke Conti, Michael Fernando, Danielle Lashley, Audrey Li, Sarah Paton, James White.

Fill out the attached application form and return to Deirdre O'Mara no later than Thursday, May 29, 2008. Selection will be made by Tommie Hata and Deirdre O'Mara.

Thank you for your interest.

Deirdre O'Mara
domara@pingry.org



Tommie S. Hata
tshata@gmail.com

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Team Supervisor: Deidre O'Mara
Cooperating Scientist: Ann Stock, UMDNJ-Robert Wood Johnson Medical School, NJ ('09)

Fill this application and answer the application question on a separate page (typed). Submit to Deirdre O'Mara by Thursday, May 29, 2008.

Name: _____

Email Address (one that you check!!!): _____

Biology Teacher: _____ Honors? (Circle) YES NO

Anticipated extracurricular projects for 2008-2009: _____

_____

I have read the program description and understand the involvement and commitment for the program. I understand that I will be representing Pingry as we meet with cooperating scientists and present at national conventions. I understand that we will be taking field trips to visit our cooperating scientist (about once each semester) and that it is my responsibility to meet my academic, athletic, and other extracurricular expectations as I participate in the SMART Team. If accepted, I will agree to the expectations of the SMART Team program and will be an active and contributing member of the Team.

Student signature: _____ Date: _____

Parent signature: _____ Data: _____

Application Question:

Ann Stock's lab is "interested in understanding structure/function aspects of signal transduction proteins". Signal transduction is involved in just about every single biological pathway and is observed in both prokaryotic and eukaryotic cells. Signal transduction proteins are often key targets for drug development. One family of receptors involved in the signal transduction pathway called the "G-protein coupled receptors (GPCR's)" are the targets for 12 of the 20 top selling drugs including Coreg for congestive heart failure, Cozaar for high blood pressure, Zoladex for breast cancer, and Zantac and Claritin for allergies.

Look up Dr. Ann Stock's webpage at The Rockefeller University website at http://www.hhmi.org/research/investigators/stock_bio.html. Read this research abstract and do a quick web search to familiarize yourself with the concept of signal transduction.

1. In your own words, describe signal transduction. Your answer needs to be concise, no longer than 4 or 5 sentences. Describe both what it IS and what it DOES.

2. What is meant by "reversible covalent modification"? What is being "modified"?

3. In your own words, describe the significance of Dr. Stock's research. Keep your answer within 4 or 5 sentences.