

# WEIZMANN *views*

## PROTEOPEDIA TURNS NEW YORK CITY STUDENTS INTO SCIENTISTS

The students in Allison Granberry's class at Hostos-Lincoln Academy, a South Bronx public school serving children in grades 6 to 12, are as excited about proteins and other biological macromolecules as most kids their age are about playing basketball or updating their Facebook status.

The passion of these newly minted scientists is due to the enthusiasm of Ms. Granberry, as well as Prof. Joel L. Sussman of the Department of Structural Biology at the Weizmann Institute of Science in Rehovot, Israel. In a Rockefeller University after-school outreach program called SMART (Students Modeling A Research Topic) Team—a nationwide project conceived by Dr. Timothy Herman, Director of the Center for Biomolecular Modeling at the Milwaukee School of Engineering—Ms. Granberry and her students work with Prof. Sussman's website *Proteopedia* ([proteopedia.org](http://proteopedia.org)).

Developed in 2007 by Prof. Sussman, together with Dr. Jaime Prilusky and Eran Hodis at the Israel Structural Proteomics Center at the Weizmann Institute, *Proteopedia* is a web resource and encyclopedia where protein and nucleic acid structures are presented in an intuitive manner, with interactive three-dimensional (3D) images appearing alongside explanatory text about the structure.

*Proteopedia* allows registered users—1,500 to date—to easily add their own structural annotations. The site's users include scientists browsing the 3D images; researchers presenting their newly solved structures;

and educators from high school to graduate school teaching structural biology by assigning site-related projects. In 2010, *Proteopedia* was selected by thousands of online readers and a panel of judges as the "Best Website" winner of *The Scientist* magazine's inaugural Labby Awards, which were created to honor "the best Web-based multimedia by labs."

*Proteopedia* embodies the Weizmann Institute's mission of "science for the benefit of humanity" by allowing the scientific community—and students from around the world—to collaborate online. Addressing the work by the Hostos-Lincoln group, Prof. Sussman exclaims that "some of the pages that these students have made are better than the scientists' pages! This shows researchers that they can learn a thing or two from high school and college students."

"The impetus for creating *Proteopedia* was a realization that 3D macromolecule structures are largely inaccessible to the majority of scientists without training in structural biology," he continues. "We strove to create a place where structures could be presented in an accessible and intuitive manner, and where annotations of such structures could be contributed even by a computer novice, provided he or she understood the structure in enough detail to communicate its key features to others."

The SMART Team students at Hostos-Lincoln worked together to study acetylcholinesterase (AChE), a key nervous-system protein that is a target for Alzheimer's disease drugs. AChE has been a cen-



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**Students involved with Prof. Sussman's *Proteopedia*, who may never have previously considered a career in the sciences, are now actively pursuing studies in neuroscience, biology, nursing, and pre-med.**

tral area of research by Prof. Sussman and a close colleague at Weizmann, Prof. Israel Silman in the Department of Neurobiology, for many years. The SMART Team began building their *Proteopedia* page three years ago, and recently completed a new page on the topic of "Substrate Traffic and Inhibition in Acetylcholinesterase."

"The students were screaming with excitement when it was finally finished and posted on the website. As their teacher, it was truly gratifying to see them follow the project through to completion," says Ms. Granberry. In fact, her students even presented the initial results of their *Proteopedia* page at the Annual SMART Team Symposium, alongside Prof. Sussman, at Rockefeller University in May 2010.

Furthermore, in February 2012, Ms. Granberry learned that a paper written by the group and Prof. Sussman about their *Proteopedia* page has been accepted for publication in the scientific journal *Biochemistry and Molecular Biology Education*. As Prof. Sussman says, "For students in a New York City public high school to have a refereed scientific paper accepted for publication—this is really spectacular!"

According to Ms. Granberry, the time her students have spent discovering science has

had an immense influence on their future education plans.

"One of my students has decided to pursue neuroscience, and has applied to colleges based on this newly discovered interest," she says. "Others have decided to actively pursue studies in biology, nursing, and pre-med. Before this program, these students might never have considered education and career paths in the sciences."

Prof. Sussman hopes that more educators and students will use *Proteopedia* to learn about the many fascinating protein and nucleic acid structures scientists have uncovered so far—and even contribute to the site. He encourages teachers to direct class projects where students are responsible for creating pages describing an assigned or chosen protein structure.

"The enthusiasm I've seen from these students is amazing. They are engaged and excited about proteins and science in a way that might not have been possible without *Proteopedia* and the support of teachers like Allison Granberry," says Prof. Sussman. "It's wonderful to see these high school students embracing the model of curiosity-driven, collaborative learning that we practice at Weizmann."

*Prof. Joel Sussman's research is supported by Mr. and Mrs. Yossie Hollander, Israel, the S. & J. Lurje Memorial Foundation, the Jean and Jula Goldwurm Memorial Foundation, the Samuel Aba & Sisel Klurman Foundation, the Bruce H. and Rosalie N. Rosen Family Foundation, Mr. and Mrs. Howard Garoon, Glencoe, IL, and the Nalvyco Trust.*

*Prof. Sussman is the incumbent of the Morton and Gladys Pickman Professorial Chair in Structural Biology.*

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