University at Buffalo Reporter

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Volume 37, Number 12 Thursday, December 1, 2005

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Bioinformatics project goes to next level

High school curriculum development expanded to include other local teachers

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Reporter Contributor

An effort to introduce local high school students to the emerging field of bioinformatics—and hopefully inspire some to pursue studies, and eventually jobs, in the field—is moving to the next level with a workshop designed to help high school teachers incorporate the topic into their own curriculums.

The "Next Generation Scientists: Training Students and Teachers" project, a program developed by UB's Center for Computational Research and funded by Verizon Corp., has been working for several years with teachers and students at Mt. St. Mary Academy in Kenmore and Orchard Park High School to provide coursework in bioinformatics for students at those schools. Other high school teachers from Erie and Niagara counties who were interested in developing such a curriculum at their schools could join the effort by attending a workshop held last night at UB.

The Bioinformatics Workshop for High School Teachers was designed to help the educators integrate bioinformatics smoothly into biology and programming courses commonly taught at the secondary level.

"The workshop on Nov. 30 was the culmination of phase one of the Next Generation project," said E. Bruce Pitman, professor of mathematics and associate dean for research and sponsored programs in the College of Arts and Sciences.

Pitman and Thomas Furlani, associate director of the Center for Computational Research (CCR) and research associate professor of chemistry, organized the program. They also serve as coordinators of the Summer High School Workshop in Computational Science offered by CCR. The summer workshop has been offered for six years, with the focus on bioinformatics beginning two years ago. That workshop attracted not only students, but also teachers eager to learn more about the field.

Bioinformatics is the application of mathematical, computing and statistical techniques to the understanding of the information of molecular biology, Pitman explained. It was used by scientists in decoding the human genome and is an important tool in the treatment of genetic diseases.

Bioinformatics "is not typically" covered as part of the high school curriculum, Pitman said, adding that he is not aware of any other formal bioinformatics programs in place at a secondary school nationwide.

The "Next Generation Scientists" project is part of the training and education component of UB's New York State Center for Excellence in Bioinformatics and Life Sciences.

High-tech jobs require a highly educated workforce familiarized at an early age with advancements in math and science, said Pitman. To guarantee the continued growth of bioinformatics in the region, educators must introduce students to biological and computational sciences in high school, he said, as well as teach them some of the basic skills used in bioinformatics. High school bioinformatics curriculum increases the chances that local students will enter the field. Pitman said by working to provide a foundation in the science of bioinformatics for students in the region, the effort prevents "brain drain" from Western New York by discouraging graduates from leaving the area to pursue jobs in science and technology.

"We need to educate the next generation," he said.

Taking the lead at last night's workshop were teachers from Orchard Park and Mt. St. Mary who already have introduced bioinformatics into the classroom through the "Next Generation Scientists" project, Pitman said. These teachers have received funds through the grant to develop curriculum over several summers. The challenge faced by everyone involved, said Pitman, is "How do you take this new idea and translate it into something interesting to a sophomore, a junior or a senior?"

The interest is there, Pitman said, pointing out that Orchard Park has an after-school bioinformatics club and Mt. St. Mary introduced a for-credit computer programming class with a focus on bioinformatics. The course is Mt. St. Mary's first true programming course, Pitman said, noting that the school previously only had offered classes in computer applications, such as Microsoft Word or Excel. Moreover, introducing bioinformatics at an all-female institution such as Mt. St. Mary's is doubly important because it encourages young women to pursue careers in sciences and technology, he added.

"We're looking to open this up to high school students around the region," said Pitman. Educators who attended the workshop received CDs with interactive lessons, PowerPoint presentations and computer program code that can be used to teach bioinformatics. Pitman said the focus was on two subject areas: biology and computer science.

The biology modules are designed to integrate smoothly into current high school course requirements, such as those for advanced placement (AP) biology, Pitman said, so teachers won't have to take time away from the mandated subjects to introduce information about bioinformatics. For example, one of the biology labs focuses on DNA using computer modeling to display proteins in three dimensions and show how scientists can use this information to detect and prevent genetic diseases.

The programming curriculum will take more time to teach because of the different state-mandated requirements for computer science, Pitman said. Although Perl is the programming language often used in bioinformatics, Java and HTML are more commonly taught to high school students, he said. Curriculum developers created a six-week module that uses students' current programming knowledge to teach elements of Perl. Pitman said the curriculum is designed so that computing or biology students can use the programs produced in the programming class to power their bioinformatics labs, or they can use the tools already provided on the CD.

While the two subject areas are obviously related, they can each be utilized independently, Pitman said. Thus, students interested in using the computer strictly as a tool to solve challenging problems in biology can readily do so, he added, noting that conversely, students interested in developing the computer-based tools themselves can readily do so through the computer-science portion of the curriculum.

