

## Glassman, 17-year old PA Senior Wins \$10,000 IEEE Presidents' Scholarship

By Lynn Murison



On 13 May 2004, 17-year old Pennsylvania USA high school senior, Elena Leah Glassman, was awarded the \$10,000 IEEE Presidents' Scholarship at the Intel International Science and Engineering Fair held in Portland, Oregon, USA for her project entitled "Brain-Computer Interface for the Muscularly Disabled." IEEE President-elect W. Cleon Anderson presented the IEEE Foundation supported Scholarship at the Special Awards Ceremony. It is the largest single award given by an organization at that ceremony.

In 2002 the Central Bucks High School West senior attended a conference at Drexel University where she saw a video showing a man using brain waves to control arm movements by thoughts to implanted electrodes. She was inspired. She thought, "why not have a computer anticipate and respond to thought-wavelets rather than training users to a computer's limitations?"

Her long-term goal is to have a Brain-Computer Interface (BCI) which would use brain waves to substitute for computer keyboard or mouse commands. Presently those with degenerative diseases like Lou Gehrig's Disease or those with paralysis must learn to work a computer assisted communication that relies on a toggle/on-off mode. When they are unable to use their muscles to work the computer, they are robbed of any use of the computer.

Her first step was to create an algorithm that interprets electroencephalography (EEG) signals with the highest possible accuracy. In 2003 she successfully achieved 90% accuracy against

international researchers using the same public domain EEG datasets to distinguish between right and left movement.

Encouraged by this achievement, in 2004 she used herself as the test subject to collect EEG wavelets by placing electrodes placed on her scalp. Then she spent 6 months adding and modifying to her 2003 code. Her new code was able to predict her own right or left movement at 73% accuracy. The difference between the public domain data and data from her own brain illustrated that eventually her software would have to be customized for each user in order to be as effective as she wanted.

Her own wavelet data has led her to write software for real streaming data, where the software must actually find brain wave commands in the midst of all the electrical impulses, like background noise, that the brain puts out. She'll be working all summer on that problem.

"Science Fair has made the biggest impact on my life, aside from my family," Ms. Glassman said. "My projects have given me an outlet for my academic energy." The poised teenager was able to answer questions from engineering professionals as well as middle school students who visited the Fair. She said the acting she did in high school made her comfortable in front of a group; entering science fairs gave her the experience to speak at many levels. She also plays varsity sports and the trumpet at her Doylestown high school.

Ms. Glassman will be attending the Massachusetts Institute of Technology in the Fall and plans to major in Electrical Engineering and Computer Science. She hopes to continue working on her project and in other areas of artificial intelligence.