

POINTS OF INTEREST

MARIA LANTIN



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The words "quantum physics" often send chills down the spines of junior high students. Quantum physics explains the behaviour of the tiny particles making up our world – electrons, protons, and neutrons. Add another layer of complexity to arrive at quantum information science. This science applies the principles and technologies of quantum physics to advance information and communication science and technology.

How does a teacher attempt to explain these complicated and often subtle ideas to students?

Simple. Employ the expertise of Maria Lantin, Visualization Researcher in the Advanced Research and Technology (ART) Laboratory at the Banff Centre. Lantin collaborates with Barry Sanders of the Institute for Quantum Information Science at the University of Calgary on a project called QViz. Using advanced visualization and sonofication techniques, the team has created an interactive virtual reality environment that educates junior high students about quantum information science (QIS).

In Lantin's QViz virtual reality game, students participate as characters in scenarios involving QIS. For example, one of the most important applications of QIS is using quantum cryptography to maintain information security. When data is transmitted across a network like NeteraNet, it is typically encoded using a mathematical algorithm. This scrambles the information so it cannot be deciphered if intercepted. However, given enough computing power and time, the mathematical algorithm can be "cracked" and the message deciphered. In quantum cryptography, data is transmitted using photons, or packets of light. The polarization of these photons is changed to precisely encode the information, making it an indecipherable message.

In one QViz vignette, a student can be Jimmy, the repair guy. Jimmy's task is to calibrate a crystal in a client's house to correctly encode messages carried by photons. Meanwhile, another character named Eve hovers over the house in a spaceship eavesdropping, trying to steal the photons and the messages they carry. Jimmy will foil Eve's attempts if he sets up the encoding correctly.

Lantin and Sanders showcased the first prototype of QViz in October at the Frontiers in Optics 2005/Laser Science XXI Conference in Tucson, Arizona.

"The QViz presentation went really well," says Lantin. "Several people came to us after the presentation and inquired about creating visualizations for their own research. It's good to know that there is a need for the kind of work we are doing."

Visualization and virtual reality tools are essential to Lantin's work. She often uses these tools to marry art and science in co-production projects with artists. She collaborated with designer Greg Judelman at the Bodies in Play Summit in May 2005 to create a web-based Flash application for visualizing human communications. In October 2004, she assisted Mexican-born artist Carmen Gerstl in creating an interactive, 3D art piece representing humans' plundering of the environment. This piece was given an honourable mention in the 2004 Art & Artificial Life International Competition.