



6-6-2007

Model Created to Help Teachers Envision Fourth Spatial Dimension

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Recommended Citation

Hatch, Rachel, "Model Created to Help Teachers Envision Fourth Spatial Dimension" (2007). *News and Events*. 194.
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June 6, 2007

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Model Created to Help Teachers Envision Fourth Spatial Dimension

BLOOMINGTON, ILL.— The concept of the fourth dimension can be a difficult one to comprehend. Although experimental physicists are now looking for ways to prove the existence of 4-D, many often instructors do not approach the subject in class because they are not sure how to teach it.

Narendra Jaggi, Illinois Wesleyan University professor and chair of the physics department, and his student Andy Nelson are looking for ways to help bring the fourth spatial dimension into the classroom.

Jaggi draws two squares on a dry erase board in a classroom at the University's Center for Natural Science. "You can't really build a cube on a blackboard because the board is two dimensional and the cube is three dimensional," said Jaggi, connecting the corners of the squares with lines. "But, you can draw a representation of a cube, so you have the perception of three dimensions." Drawing on that idea, Jaggi and Nelson, an Illinois Wesleyan senior physics and religion double major from Mahomet, Ill., began to conquer the questions: Could there be a fourth spatial dimension and how can you display that in a three-dimensional world?

Jaggi and Nelson took the idea of creating a cube, and built upon it. "We wanted to create a model to replicate the fourth dimension in a spatial way. The goal was to create a teaching tool to help visualize 4D," said Nelson, who is spending the summer conducting research on microcavity plasma displays at the University of Illinois.

The two spent a year developing, and then building, the model, which at first looks like a collection of colorful wires. A number of cubes made of electrical resistors are stacked on top of each other and connected with different resistors of varying colors. "What we wanted to do was to connect *every* piece to *every other* piece," said Nelson.

Scientists have struggled for ways to "discover" the fourth spatial dimension, which may affect the way we measure gravity, as suggested by Lisa Randall, professor of theoretical physics at Harvard University. The model created by Jaggi and Nelson does not serve to prove the

existence of a fourth dimension, but rather suggests a way for teachers to talk about it. “We are not trying to directly verify Lisa’s work. We are working in parallel to develop experimental models of interactions in higher spatial dimensions,” said Jaggi. “It’s a pedagogical way of thinking about how the fourth dimension *could* reveal itself in experimentation.”

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