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Physicist makes string theory look simple

By Julie Kirkwood
Staff Writer

Only a small percentage of humans will ever understand the details of what Harvard theoretical physicist Shiraz Minwalla does for a living. He specializes in string theory, a way of looking at the universe that boils everything down to one or two fundamental laws. Researchers in this field don't just use math. They invent math. Not exactly the kind of thing Minwalla can debate at cocktail parties.

Yet in shorts and sandals on a recent spring afternoon, Minwalla communicated at least the basics to an astronomy and modern physics class at Lawrence High School.



"The goal of physics is always to characterize the universe in some kind of physical way," Minwalla said. "Given the state of the universe now, can we determine what the state of the universe will be any time in the future?"

JULIE KIRKWOOD/Staff photo
Shiraz Minwalla lectures on string theory for a Lawrence High School physics class.

Minwalla visits this class every three weeks through a new program sponsored by the National Science Foundation. Lawrence is one of five school districts in the Boston area participating this year. The other schools, including Swampscott and Gloucester, are partnered with physicists from Massachusetts Institute of Technology, Northeastern, Tufts and Brandeis universities.

Before they met Minwalla, many of the Lawrence students worried the material might be over their heads, said Ruben Melendez, 18.

"We felt we were unprepared," he said, "but he made it really simple."

The class itself was the idea of teacher Jesus Hernandez, who left an industry job to become a teacher four years ago. He wanted to get the students excited about modern physics, which is beyond the scope of most high school physics text books. Finding a program that brings in a Harvard physicist to give guest lectures was icing on the cake, he said.

"It's quite something that a professor from a university would come to talk to them," Hernandez said.

With wild hand gestures and excitement in his voice, Minwalla told the students at a recent Thursday afternoon class why physicists care about string theory. At first, he said, chemists were happy to discover that all things in nature -- from human skin to rocks to water -- are made of the same 92 basic elements: hydrogen, oxygen, carbon, nitrogen, etc.. Then they realized these elements are made of even more fundamental pieces: protons, neutrons and electrons. In the last century, scientists have discovered that even these are made up of smaller pieces called quarks and neutrinos.

There only a few basic fundamental forces that act on these particles.

The problem is, current theory can't explain one fundamental force: gravity, Minwalla said. That's where string theory comes in. Physicists hope string theory is the way to explain the universe that encompasses everything.

"This smells rather exciting," Minwalla said. "Maybe logic is enough, just pure thought is enough, to understand how the world works."

The students followed him through the lecture, asking questions and moving their lips in sync as Minwalla listed the types of quarks.

Minwalla hopes the light bulb will turn on in at least a few minds as a result of his lectures. He and several of his friends each had a moment growing up when a teacher got them excited about physics. Though the concepts are difficult, he enjoys the challenge of explaining them.

"I actually think it's not hard," Minwalla said. "As (physicist Richard) Feynman once said, if you can't make something plainly understandable to anyone, then you don't understand it."

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