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Need to know how friction affects moving objects? Ever wonder what the term spintronics means? Well, now there's a simple solution ...

Ask Hal

UNL professor hopes to end fear of physics with a virtual teacher

BY MATTHEW HANSEN
Lincoln Journal Star

Christian Binek has learned the hard way that most Nebraskans, and most human beings, are terrified by physics.

He recognizes the look of horror when he tells new friends he's into magnetic heterostructures.

The University of Nebraska-Lincoln physics professor can read their glazed-over eyes. He knows when it's time to start talking about something else.

"I try to show people that I am completely normal, that I order the same beer and so forth," says Binek, who came to Nebraska from Germany in 2003.

"But the poor guys — when I start talking about physics, the evening is done."

Binek hopes to use his new National Science Foundation early career award to take some of the fear out of the subject matter.

He's in the process of designing a Web-based system that will allow UNL students, as well as the public, to ask even the simplest questions about physics, then get an answer from a virtual instructor who won't sneer at their small minds.

An unfinished prototype named Hal now exists on Binek's Web site, willing and ready to answer any questions day or night.

Ask Hal, "What is spintronics?" and she'll define the term for you, explaining it's an extension of conventional electronics that focuses on harnessing the power that electrons produce when they spin.

A spintronics breakthrough may allow someone to build a computer more powerful than ever before.

"This is really assumed to be the basis of an information technology revolution," Binek says.

"For a country like the United States that wants to be high-tech, it has to be at the cutting edge of this technology."

That seems easy enough until Binek tries to explain his specific area of interest inside spintronics.

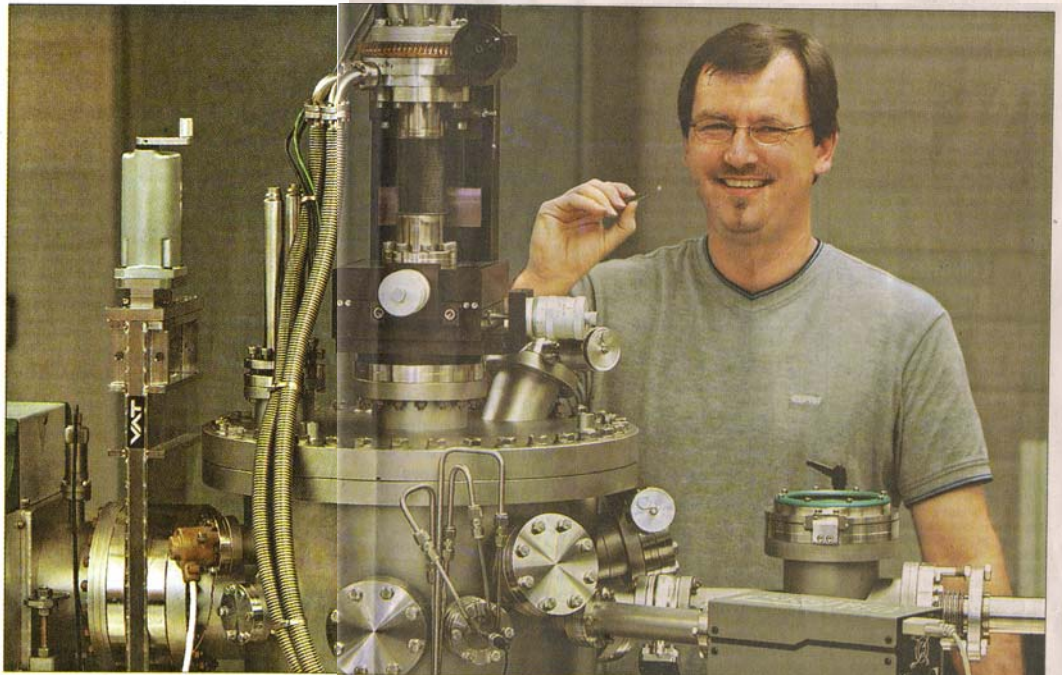
It involves the study of a magnetic multilayer now used to run computers even though no one understands exactly how it works.

Binek wants to understand this multilayer and control it by applying electric fields.

The professor stops talking before his visitor's eyes glaze over.

This is where Binek hopes a new, powerful Hal can help.

He will use a small part of the \$500,000, five-year award to design a more advanced system to answer physics questions. (Most of the money will go to his



Christian Binek, physics professor at the University of Nebraska-Lincoln, shows off a molecular beam epitaxy machine that produces very thin films, like the one he holds in tweezers, that he uses to study magnetism.

spintronics research.)

The professor says he'll use graduate students who are more computer savvy than he to design the system. Eventually, you'll be able to name your physics "instructor," make him or her look how you want and then ask the "teacher" any questions you'd like.

"My major interest is spreading the beautiful news about this research," he says. "I hope I can do it in a way that not just experts but the layman can understand."

Hal will also have a built-in sense of humor to deflect questions she can't answer.

For example, ask her: "Who is Jesus?"

Hal answers: "I guess he loves me?"

The professor himself jovially answers a variety of basic physics questions during a tour of his laboratory.

He shows off the lab's pride and joy — a machine called an MBE (that's molecular beam epitaxy for the scientifically inclined) that can heat different thin films of metal and then combine them to create a new material.

The machine has a more powerful vacuum than the vacuum between the Earth and the moon, he says with

pride. It also cost \$250,000.

"Is this nice or what," he says as he pats the machine.

In truth, he'd love to talk physics all afternoon, until he reaches the edge of things he understands.

But he understands that, outside of UNL's Ferguson Hall, he must divvy out spintronics information in small doses. Usually, he says, he'll follow that with a question about his new buddy's line of work.

"Then I can feel like the idiot," he says.

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