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CU scientists eye spokes

Team aims to solve Saturn's dust particle mystery

By Todd Neff, Camera Staff Writer
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A compact disc is a digital peacock, exhibiting a rainbow of spokes under bright light. Saturn's rings do the same thing without the rainbow, Voyager 1 first found in 1980.

But unlike the aluminum film of a CD, the dust particles reflecting the ringed planet's spokes show off only periodically, and their underlying motivation has remained a mystery.

The secret may survive only another few months, said the authors of a paper published in today in the journal Science.

Colin Mitchell, who will earn his Ph.D. in physics from the University of Colorado in May, specializes in spokes and began working two weeks ago with Carolyn Porco's Cassini imaging team at Boulder's Space Science Institute.

Mitchell, Porco, CU physicist Mihaly Horanyi of the Laboratory for Atmospheric and Space Physics, and Ove Havnes, an aurora specialist from the University of Tromso in Norway, are co-authors of the paper. They said the spokes appear either dark or light when the light hits Saturn's rings at a certain angle and that should be happening again in July.

The spokes can be massive — 6,000 miles long and 1,500 miles wide. The paper presents a theory of the mechanics behind their display. It's a bit more complicated than light off a CD.

They say the spokes appear seasonally, depending on the rings' inclination during Saturn's 30-year orbit. When the time comes, sunlight hits the plasma surrounding the rings in a certain way. The plasma is a gas of former ring material in which atoms have had their electrons blasted away by sunlight, the researchers believe. The freed electrons land on ring material, both hunks of rock and ice and microscopic dust particles.

It all becomes negatively charged, Mitchell said, bringing about the same sort of repulsion felt when negative poles of two magnets are forced together. Dust levitates abruptly and en masse — up to 50 miles above the rings — reflecting or absorbing light. Voila: spokes. Maybe.

"Hopefully they'll show up," Mitchell said. "We don't know if they will."

Horanyi, who is Mitchell's Ph.D. adviser, said Cassini's high-speed, high-resolution imagers may provide the information needed to back up the theory. He said the spokes' discovery launched a new field in physics focused on "complex plasmas" or, more humbly, "dusty plasmas."

"We had to look for other factors — electricity and magnetism — typically something that planet rings people would never consider," Horanyi said.

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