Racking up the physics of pool

A (supposedly) misspent youth becomes a rewarding career for mechanical engineering professor

by Paul Miller

Mechanical engineering Professor Dave Alciatore tends to describe his youth as a misspent time hanging around the bowling alley and pool tables close to Antoine's, a restaurant run by his family in the French Quarter of New Orleans.

But ultimately, all the years he spent racking up balls has paid off – he's now known as a devoted pool and billiard enthusiast and an expert in understanding the physics of the game. And he's passionate about teaching students the intricate principles behind one solid object cracking into another.

Alciatore's misspent youth, you could say, is continuing to reap benefits. He hosts a popular website (billiards.colostate.edu), which includes teaching aids, links to physics resources, discussion threads, and an engaging mix of super-slow-motion videos that show pool and billiards principles.

"A few years ago, Dave gave a talk on the physics of pool in a local pool hall, not a lecture hall," says Brian Jones, director of the Little Shop of Physics. "That's something I really applaud – taking science outside the classroom to show students how it applies to the world around them. He has a real passion for teaching and for pool, and he merges them really well."

Each semester, Alciatore's students learn mechatronics, which focuses on the precision control of mechanical and machine systems. Students use that knowledge to design projects such as a cue-testing machine, or CTM.

The CTM may well revolutionize the cue stick manufacturing industry. Built from scratch, the machine measures and compares different cue sticks by measuring the squirt, or angular change, in the initial cue ball direction caused by an off-center hit. The machine releases a cue stick attached to a spring-loaded carriage that slides on a rail into a cue ball. A scale at the end of the table measures the squirt angle.

The team also hopes to add accelerometers and microphones to quantify the feel and sound of a cue, two crucial (and difficult to measure) qualities of cue sticks. Results of the research may lead to a numbering system that could be used on packaging labels in the retail market.

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"We apply everything we learn to an actual project," says Chris Ward, senior mechanical engineering student. "Unfortunately, I'm still a pretty awful pool player."

John Eisele

"Dr. Dave" Alciatore studies the physics of pool and hosts a popular website on the topic.

Alciatore joined the College of Engineering in 1990 as an expert in robotics and the motion of machines. In 1998, he took a sabbatical in Washington, D.C., to work on a textbook and a government project. To fill up his down time, he joined a pool league and read books on pool playing. He decided to write his own book, *The Illustrated Principles of Pool and Billiards*, after observing incorrect descriptions in other books of the physics behind billiards.

Alciatore received master's and doctorate degrees in mechanical engineering from the University of Texas at Austin in 1987 and 1989, respectively.

He remains an avid bower and rolled a perfect game of 300 several years ago. ◆