

Carl Lutzer, Rochester Institute of Technology

## Hammering Home Undergraduate Mathematics



### Abstract:

Grab a hardcover book from your shelf. Really, this is an “audience participation” abstract, so grab a book. I’ll wait. (If you have a rubber band available, put it around the book.) Now stand up and hold the book in your hands so that the cover is parallel to the ground and you can read the title. The book has three natural axes, the longest of which is parallel to its spine. It’s easy to spin the book about this long axis. With a little more effort, you can catch it after one revolution and find that you can still read the title. (Try it!) The short axis of the book extends from the front cover to the back cover, perpendicular to the spine. Spinning about this axis is also easy. However, something strange happens when you try to spin the book about its medium-length axis, which is perpendicular to the other two, extending across the width of the book from its spine to its fore edge: the book twists in the air! When I first encountered this physical phenomenon, I saw it with a hammer, in which the twist is apparent when you compare the orientation before you toss and after you catch the hammer. (You can try this at home, but be careful! Maybe wear a helmet.) In this talk I’ll use multivariable calculus, differential equations, and linear algebra to provide mathematical insight into this twisting phenomenon.

### Biography:

Carl Lutzer has always been interested in ways that the physical world informs our understanding of mathematics, and vice versa. He earned his Ph.D. at the University of Kentucky where his dissertation (under the direction of Peter Hislop) focused on the mathematics of electrical impedance tomography. Since then he has been a faculty member at the Rochester Institute of Technology, where he has participated in several applied research projects including the study of micro-electromechanical systems (MEMS), mobile ad-hoc networks (MANETS), and a method of using partial differential equations to determine the health of the human eye based on light-scattering data. RIT has also been a place where Dr. Lutzer has been able to continue pursuing his interest in teaching; in 2006 he won the MAA’s Carl B. Allendoerfer Award for Expository Excellence, and in 2013 Dr. Lutzer earned the university’s Eisenhart Award for Excellence in Teaching.