

# Physics instructor writes book on shock waves

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A sonic boom and a thunderclap may seem like different phenomena, but their behavior is the same, according to SDState Physics Instructor W. Robert Matson. This is one of the ways he explains shock waves in "Sonic Thunder," his latest book.

"I want to explain things in a way that everyone can understand," said Matson, who has been teaching college physics for nearly 15 years. He earned his doctorate from Oklahoma State University in 2004 and came to South Dakota State in spring 2017.

"I try to bring seemingly unrelated things together under the umbrella of [shock](#) waves," Matson said. "The only difference between a jet's [sonic boom](#) and a thunderclap is the way the shock wave is created."

This is the second book Matson has written for Morgan and Claypool Publishers. "The first one about earthquakes, geared toward a general audience, was very well received, so Joel Claypool asked me to write another one for a college audience," Matson said.

"Sonic Thunder" is tailored to a sophomore or junior level and addresses topics suitable for aerospace engineering, fluid mechanics and dynamics, as well as meteorology. Matson looks at supersonic flight and [aircraft design](#), including consequences of shock wave dynamics and shock waves related to weather systems, earthquakes and dry lightning.

"I address wing design and the struggle to reach supersonic speeds," said Matson, who studied aerospace engineering in Oklahoma and gained expertise in fluid flow and erosion. Excerpts are available at [iopscience.iop.org/book/978-1-68174-966-2](http://iopscience.iop.org/book/978-1-68174-966-2), where the book can be

purchased and downloaded.

"When I'm writing a book, I like to tell a story," explained Matson. "That's why the first chapter talks about the mythological stories that ancient people invented, such as Zeus on Mount Olympus, to explain lightning and thunder, which then segues into the modern understanding of [shock waves](#)."

His narrative moves from explaining basic functions to the equations necessary to understand the science. "Math is a language, but not everyone speaks that language. When I present math, I try to translate it into a form people can understand, and if they understand math, they can even apply it," he said.

"My hope is by taking these 'wow things,' like earthquakes, lightning and thunder, that nature provides free with no explanation, and use language that you can understand to say 'this is what we know and here is some of the science behind how it works,'" Matson said.

In the opening section of the book, Matson uses the image of an inquisitive child sitting on his father's knee and then comes full circle in the final chapter telling his readers, "the next time you're at the fireplace with the family, instead of telling ghost stories, you can talk from a knowledgeable point of view and impress everyone."

**More information:** Sonic Thunder: A discussion of natural and artificial shock waves. [iopscience.iop.org/book/978-1-68174-966-2](http://iopscience.iop.org/book/978-1-68174-966-2)

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