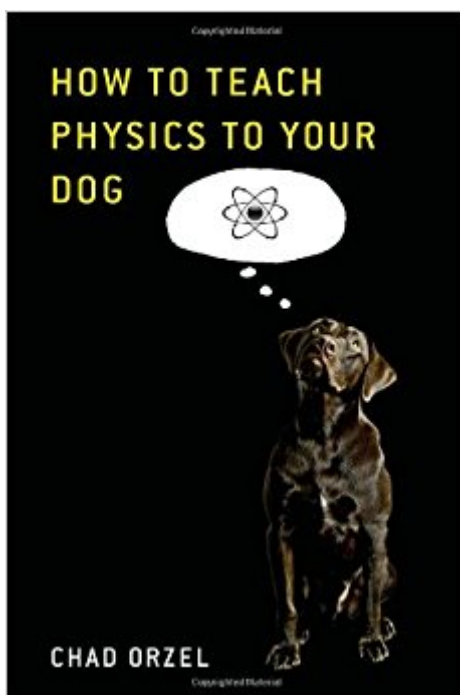


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# How To Teach Physics To Your Dog



## Synopsis

When physics professor Chad Orzel went to the pound to adopt a dog, he never imagined Emmy. She wasn't just a friendly mutt who needed a home; she was a talking dog with an active interest in what her new owner did for a living and how it could work for her. Soon Emmy was trying to use the strange ideas of quantum mechanics for the really important things in her life: chasing critters, getting treats, and going for walks. She peppered Chad with questions: Could she use quantum tunneling to get through the neighbor's fence and chase bunnies? What about quantum teleportation to catch squirrels before they climb out of reach? Where are all the universes in which Chad drops steak on the floor? And what about the bunnies made of cheese that ought to be appearing out of nothing in the backyard? With great humor and clarity, Chad Orzel explains to Emmy, and to human readers, just what quantum mechanics is and how it works -- and why, although you can't use it to catch squirrels or eat steak, it's still bizarre, amazing, and important to every dog and human. Follow along as Chad and Emmy discuss the central elements of quantum theory, from particles that behave like waves and Heisenberg's uncertainty principle to entanglement ("spooky action at a distance") and virtual particles. Along the way, they discuss the history of the theory, such as the experiments that discovered that electrons are waves and particles at the same time, and Albert Einstein and Niels Bohr's decades-long debate over what quantum theory really meant (Einstein may have been smarter, but Bohr was right more often). Don't get caught looking less informed than Emmy. "How to Teach Physics to Your Dog" will show you the universe that lies beneath everyday reality, in all its randomness, uncertainty, and wonder. "Forget Schrodinger's Cat," says Emmy, "quantum physics is all about dogs." And once you see quantum physics explained to a dog, you'll never see the world the same way again.

## Book Information

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## Customer Reviews

What do dog treats and chasing squirrels have to do with quantum mechanics? Much more than you might imagine, as Orzel explains in this fun introduction to modern physics based on a series of conversations with his dog Emmy. Dogs make the perfect sounding board for physics talk, because they approach the world with fewer preconceptions than humans, and always expect the unexpected. Physicist Orzel begins with the basics, explaining how light can be both particle and wave simultaneously—a bit like a dog that can split itself into two to chase a rabbit no matter which direction it runs. A look at Heisenberg's uncertainty principle begins with a hunt for a hypothetical bone. Schrödinger's cat becomes, of course, Schrödinger's dog. Quantum entanglement, quantum teleportation and virtual particles (composed, for example, of bunny-antibunny pairs) are all explained with the author's characteristic lighthearted touch. While Orzel's presentation may be a bit too precious for some, readers who've shied away from popular treatments of physics in the past may find his cheerful discussion a real treat. (Dec.) Copyright © Reed Business Information, a division of Reed Elsevier Inc. All rights reserved.

Particle physicist Orzel has a smart and energetic German shepherd-mix, Emmy, who's interested in what he does for a living that keeps her in treats and kibble. So she asks him about it, and he tells her, with plenty of chaseable bunnies and squirrels illustratively standing-in for photons, electrons, and other particles. He cheerfully and uncommonly clearly explains particle-wave duality; Heisenberg's uncertainty principle (and the popular-media misuse of it); photon superposition and polarization; wave-function collapse and Bohr's strict discrimination between quantum and classical physics; the many-worlds view of quantum mechanics that defies wave-function collapse; the quantum Zeno effect; quantum tunneling (right through "solid" barriers); entanglement and how it enables teleportation (at the quantum scale, that is); virtual particles and quantum electrodynamics; and the fraudulence of quantum-mechanics-exploiting "free energy" and healing schemes. Emmy attempts to apply her new knowledge practically (to catch squirrels and bunnies) keeps the conversation moving. It's hard to imagine a better way for the mathematically and scientifically challenged, in particular, to grasp basic quantum physics. --Ray Olson

Understanding quantum physics is a challenge, even for the keener students. But it's worth it, offering scientific, even philosophical, perspectives in new and diverse fields. Chad touches on these but is alert to snake oil salesmen. This book tells it straight and does not indulge turkeys (or evil squirrels). The explanation through discourse is a tried and true method, pioneered in the case of Galileo with fellow humans. Emmy's canine musings provide Chad with a wealth of useful examples to clarify theories. Many authors tackle quantum physics at an introductory level and attempt the difficult task of explaining a mathematical subject without maths. A strength of this shorter book is the option to easily reread a point that did not sink in. There can be no pretence that quantum physics is any other than a mathematical world that can defy comprehension. Accessible books like this one are the rabbit that will entice future physicists into that field. Views on quantum theory vary as do teaching methods, so readers can improve their grasp by reading similar introductory books. A sometimes different treatment of many of the same topics, with a focus on glossy artwork rather than canine prerogative, is Jim Al-Khalili's *Quantum: A Guide for the Perplexed*.

I was intrigued by the title *How to Teach Physics to Your Dog* and checked it out at the library. I never took physics in college or even high school, but my sister is an engineer, and I thought maybe I could pick up a few key words to drop into a conversation to impress her. And I love dogs. I can't say I can even begin to understand quantum physics or quantum mechanics, but I love the dog Emmy, and I might be getting the hang of quantum dog bones. Obviously you have to have some background knowledge and familiarity with physics to be a fair judge of this book. However, it does seem that the analogies used with bunnies, squirrels, steak and dog bones to help Emmy understand the concepts must surely also help physics students as well. I still don't understand physics, but I like the dog and the interaction between her and Orzel so much, that I am already 3/4 of the way through the book. I am buying 2 copies as presents: one for a friend whose son is a nuclear physicist (so she can also pick up some buzz words) and one for my sister, the engineer, who is also a dog lover. Perhaps if I had had a teacher like Orzel, physics would have appealed to me.

Physicist Chad Orzel talks to his dog. This is not all that unusual. Many pet owners talk to their pets and dogs make particularly good listeners. What might be a little strange is that Professor Orzel talks to his German Sheppard mix Emma about quantum physics. It turns out that dogs have a good intuitive grasp of quantum physics so they are able to have long conversations on quantum physics.

In *How to Teach Physics to Your Dog*, Chad Orzel relates these conversations in which he explains to an eager Emma the basics of quantum physics. Emma interrupts his explanations with just the sort of questions the reader might happen to have. The dog and physicist talk about such topics as the uncertainty principle, virtual particles, quantum tunneling and entanglement. It's a fun idea and Chad Orzel does a terrific job explaining physics to the lay reader in the guise of talking to his dog. He seems to have a good feel for how a dog acts and thinks, and I have no trouble imagining that if a dog could talk about physics she would be just as excitable, and as easily distracted by squirrels, bunnies, and treats. The most important chapter in this book must be the last one, *Beware of Evil Squirrels*. Here Professor Orzel warns the reader of the misuses and outright scams involving quantum physics. There are any number of con artists and New Age frauds who make use of scientific sounding terminology to mislead their victims into believing that one can get free energy from "vacuum energy" or heal oneself of all diseases by imagining oneself to be perfectly healthy. As Orzel explains, despite the many weird and wonderful manifestations of quantum physics, it is not magic, and follows the same sort of rules as anything else in the universe, including the common sense rule that if it sounds too good to be true, it probably is. I found *How to Teach Physics to Your Dog* to be appealing and informative. I think that some of the explanations were a bit hard to follow but that is perhaps more my fault than the writer's.

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