



# **Zoom: How Everything Moves: From Atoms and Galaxies to Blizzards and Bees**

*Bob Berman*

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**Zoom: How Everything Moves: From Atoms and Galaxies to Blizzards and Bees** Bob Berman  
From the speed of light to moving mountains--and everything in between--ZOOM explores how the universe and its objects move.

If you sit as still as you can in a quiet room, you might be able to convince yourself that nothing is moving. But air currents are still wafting around you. Blood rushes through your veins. The atoms in your chair jiggle furiously. In fact, the planet you are sitting on is whizzing through space thirty-five times faster than the speed of sound.

Natural motion dominates our lives and the intricate mechanics of the world around us. In ZOOM, Bob Berman explores how motion shapes every aspect of the universe, literally from the ground up. With an entertaining style and a gift for distilling the wondrous, Berman spans astronomy, geology, biology, meteorology, and the history of science, uncovering how clouds stay aloft, how the Earth's rotation curves a home run's flight, and why a mosquito's familiar whine resembles a telephone's dial tone.

For readers who love to get smarter without realizing it, ZOOM bursts with science writing at its best.

## **Zoom: How Everything Moves: From Atoms and Galaxies to Blizzards and Bees Details**

Date : Published June 24th 2014 by Little, Brown and Company (first published January 1st 2014)

ISBN : 9780316217408

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Format : Hardcover 336 pages

Genre : Science, Nonfiction, Physics, Environment, Nature

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# **From Reader Review Zoom: How Everything Moves: From Atoms and Galaxies to Blizzards and Bees for online ebook**

## **Feroz Khan Hamid says**

This book traverses motion from a sluggish scale as slow as the rate of flow of molasses, and goes through air movement, waves in the ocean, earthquakes, the spin of planets, the speeds at which photons go, and beyond to the theoretical tachyons, and their realm beyond the speed of light, also about the expanding universe, and a lot lot more !!! Very informative and exciting and curious read :D

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## **Cropredy says**

Normally I like these kind of popular science books as they expand my knowledge while being readable. In this case, 'Zoom' had mixed success. Berman does best when he writes about astronomical subjects and his chapters on how items in the solar system and universe move were well done and interesting. The chapters on the physical earth and how things like rivers or sound moves were also interesting.

Where the book bogs down is in its attempt to be comprehensive, such as how fast sap moves, trees grow, wings flap, animals race, nerve impulses fire, and so on. After a while, it got a bit tedious and it was easy to put the book down after a couple of chapters before restarting another day.

I will say, Berman has excellent lengthy footnotes (more deeper asides than citations) and after reading a chapter, it was always worth reading his footnotes in the back.

Read 'Stuff Matters' by Miodownik first before 'Zoom'

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## **E says**

This is kind of a weird book. It's "unifying" theme is motion but, come on, absolutely everything moves, so I guess this is a book about . . . everything? We get sloths, stalactites (1 inch per 500 years!), magnetic poles, sand dunes, toilet water, snow, mosquitoes, clouds, ocean waves, pendulums, nerve impulses, volcanic eruptions, radon, movies, neutrinos (my favorite), light, the moon . . . I could go on and on and on. It was all interesting, very random, and a hoot to read. Perhaps most fascinating is faster-than-the-speed-of-light "communication" by twin quantum particles, which can instantaneously react to an action against the other particle (and I do mean instantaneous). If you want to blow your mind, read this article (although Berman explains it a bit more easily!).

He also talks about the universe being infinite in size, although I'm less convinced there.

Fun stuff throughout this book, if you want to appreciate the natural world just a bit more.

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## Ryan says

In almost five years, I've only reviewed two other science books, *The Disappearing Spoon* by Sam Kean and *Animal Wise* by Virginia Morell. Given how much I enjoyed both of those books, I'm really not sure why I've tended to distance myself from science books, I'm not even sure if I've done it on purpose or not. I do know that going forward, I'll be accepting them for review more often. Science was always one of my favorite subjects in school, and I guess it still is.

In *Zoom*, Bob Berman makes Earth science fun again. I know there is biology mixed up in here as well, but it's the Earth sciences that really get the author's attention. He doesn't make the material read as if you are in the middle of a boring lecture, being conducted by an even duller professor. Instead he makes it feel as if you have gotten to go on a field trip to a local science museum, where you get to immerse yourself in hands on learning. At the same time, he doesn't talk down to his readers, treating us as if we are in kindergarten, too dumb to understand hard concepts, or remember the names of scientists who really mattered. It's a fine line for an author to walk, and Bob Berman not only managed to do it, he gives an Olympic level balancing act, worthy of Maria Olaru.

I'm not going to go into every fact and figure that the author shares with us. But If you have ever wanted to know how blizzards works, get a definitive answer on what thunder is, how light really moves, or what causes the sap in a tree to move, this is the book for you.

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## Gail says

What fun! Bob Berman makes (almost) everything he talks about understandable and his essays are full of thing you are thrilled that he told you. Now I just wish I could remember all the interesting facts he shared.

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## Tammy Jo says

"Zoom" does what every great book does: It places the reader in a position of wanting to hurry on to read Berman's next alluring description and while yet wanting to read a little more slowly to share in his wonderful glimpses of our world. It is as though Berman takes you by the hand to lead you bouncing from one marvel to the next through ever-changing exhibits of motion. His stories and wit bring to life what could have turned into a dry recitation of a mundane series of factoids under another author.

Berman does not limit his audience through distancing academic language nor put off with a didactic approach. His descriptions and style welcome the casual reader as well as members of academia who have long held an appreciation of "motion."

Do not rush through "Zoom." Read it in sections; then, step out of the text into the room, the outdoors, or the universe to linger in the amazing realities of motion that Berman has brought to light.

\* I received this book through Goodreads First Reads. In no way has this influenced my opinion of this book.

The delight I had in reading it was genuine, as are my opinions expressed in this review.

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### **Dee Eisel says**

Ahhh... this was what I needed after *Nothing* did nothing for me. I blazed through *Zoom* (appropriately, given the title) and found it to be like *Cosmos* in a lovely way. Berman reminds me of Sagan as he teaches both history and science as one.

Starting from the very slow and going to the very fast, Berman tells the story of speed almost as a quest. He inserts the stories of his going to talk to experts in various fields into the history of how we figured out speeds of just about everything. It's a joy to explore, even if the various people involved could be less than savory themselves.

Highly recommended! Five stars.

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### **Peter Mcloughlin says**

Pleasantly jumps from science topic to science topic from bacteria to galaxies with a thin thread of motion holding it together pleasant, diverting and informative.

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### **David Moorhouse says**

Fascinating book, written in typical Berman style, and so for the facts presented and the non-wooden style I would have given 5 stars. However, he insists on using non-metric units which cost him one star. At the end he tries to justify this by saying that his market is only the US and English speaking markets such as the UK. I know Americans are sticks in the mud, but I am not far short of 50, from the UK, and have only used metric for 40 years - our schools switched at the same time as the old money was phased out. Therefore, that silly attempt at a justification cost him another star.

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### **Anne Dunham says**

I just wrote a review for a book called Zoom. Apparently I choose the wrong book. It is a picture book for children. This is the one I really read. Now I will have to find the other book in the children's library to see if it too deserves my review! Here's the real book (and review)!

Zoowie! My mind is expanding faster than the speed of light. The astronomer who wrote this is not afraid of exploring movement, from the rate at which the universe is expanding to the rate your blood moves through your capillaries or molasses flows in January.

Bob Berman makes the unexplainable attainable with clarity, wit, and humor. I could only read a few pages a night so my mind would not explode. For anyone who wants to expand their universe, this is a book for you.

But wait! There's more. He knows that we don't know it all and looks forward with anticipation and humility to the next millennia when we are able to explore even more that we don't yet know. This book is truly a science adventure.

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### **Shirley says**

Zippping through books like this one always reminds me why I love science. I don't normally write reviews of books because I tend to give things away, but I really liked the writing style and the quotes at the beginning of each chapter and the clever titles. I liked the mythology references and the mini history lessons. And, of course, I loved the chapter devoted to my favorite molecule, water!

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### **Pamela says**

The universe is in continual motion. Everything is constantly being pushed or pulled, contracting or expanding, flying, running, flowing, rising, ebbing, orbiting or vibrating. Some obviously, we see happening; some, we do not because events are moving either too slowly or far too fast for us to register.

**Zoom: From Atoms and Galaxies to Blizzards and Bees: How Everything Moves** is the book to read if you want to know what is causing it all. I love reading physics books. I don't even pretend to understand a lot of it but I figure it's like reading anything else, the more I do it, the more it will make sense. That, and the world it shows me is absolutely fantastical only it's real. This is a very good one, full of interesting facts and the background stories of how the men who discovered them went about it. It's also written for a general reader so even if you never took physics, you'll be able to understand it although you may have to work a little at the last couple of chapters. Plus, you can finally solve the age old question of whether that falling tree in the empty forest makes a sound or not and if water actually flows in the opposite direction below the equator.

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### **Rossdavidh says**

Roughly speaking, popular science books can be split into two categories. The first, is the Big Idea books. Nassim Nicholas Taleb's "Black Swan", or Stephen Pinker's "Better Angels of our Nature", or E.O.Wilson's "The Social Conquest of Earth". The second, is the Many Little Ideas books. They are often collections of essays, but even when they're not, they are many different ideas, each getting a chapter or so, related perhaps in some general way but not part of one overarching theme. This is most decidedly a book in the second category.

Which is not, by the way, a problem. Not every book should be a Big Idea book. Sometimes it's more important to look at a lot of different topics, without trying to shepherd them into the service of one grand thesis. Bob Berman, here, is mostly occupied with showing us that everything moves, some things faster and other slower. It's not what I would call a Big Idea, and he doesn't present it as such, but it is well worth our attention.

For one thing, we naturally tend to regard the things around us as either moving, or not. In fact, though, pretty much everything is moving, and the question is how quickly, and compared to what, and in what

direction. He looks not only at how animals (e.g. insects) move, but also at how plants move. I normally forget that they move, except when I come outside in the morning and realize that the ivy have thrown up another foot of tendrils, again, and I thought I just trimmed them back to the windows just a few days ago. Did that happen overnight?

We look at how the universe moves (outwards), how dust motes move, how blood moves, how food moves as we digest it, how water moves down, how the air moves around (sometimes very fast). There are a lot of facts here, but Berman is good at breaking them into bite-sized chunks, and is enough of a storyteller to make it an easy process. In fact, for such a breezy and relaxing read, it was astonishing afterwards to realize just how many numbers and science facts he threw at the reader, without it ever seeming the slightest bit like a textbook.

Of course, the fact that *Everything Moves* is itself somewhat of a Big Idea. It's not one that you hadn't thought of before, like the idea of a meme or the idea of a black swan, but it is one that is so easy to forget that it is well worth your time to read a book which is good at reminding you of it.

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## **Stewart says**

It is a truth in modern science that everything in the universe moves – or perhaps we should say that no thing can be said or proven to be motionless; in the universe, how can we find any frame of reference in which one can measure if an object is still? The third law of thermodynamics says that a temperature of absolute zero (where theoretically the motion of atoms stops) cannot be physically achieved because it's impossible for the entropy (or disorder) of a system to hit zero.

If everything in the universe moves, astronomy writer Bob Berman does a fine job of exploring the range of this movement, from the slowest to the fastest, in his 2014 book “*Zoom: How Everything Moves, From Atoms and Galaxies to Blizzards and Bees.*” This is a book with fascinating facts about everyday life, a book that can be understood by anyone who took science in high school.

Berman starts with the human experience of speed. He points out that the fastest recorded human speed in 2009 was Jamaica's Usain Bolt who ran the 100-meter dash in 9.58 seconds or 23 miles a hour. The fastest mile was 43 minutes and 13 seconds or 16 miles an hour.

Most people living in the 20th and 21st centuries do not realize how much more we travel compared to our ancestors: “Average Americans walk 65,000 miles in their lives. More than twice around the world. That's not so different from our ancestors. But this is: we each travel a million miles over the course of a lifetime. Such a degree of movement was unheard of until recently.”

Other “moving” facts: Snowflakes fall at 3 miles an hour. Mosquitoes fly at 2.5 miles an hour (and many of them give off a drone in the musical note A, the same as a telephone's dial tone, Berman says). Bees are faster, 7 miles an hour. Animals? The cheetah and sailfish can reach 68 miles per hour. Plants? Trees grow 1-2 feet a year. Rivers move at 0.5 to 25 mph.

Tectonic plates move around 1-4 inches a year, while earthquake waves average 5 miles a second. Earth's magnetic poles have been moving 22 feet an hour during the past century.

Have you ever considered the speed of seasons? “In subtropical Florida, Southern California, and Texas, spring begins in February and moves one hundred miles north each week.”

Berman writes that the human brain, only 2 percent of the body's mass, consumes 20 percent of the body's energy. Electricity flowing along a copper wire travels at 96% the speed of light. The human brain's neural strands conduct electromagnetic impulses at 390 feet per second, or one-millionth the speed of light. But that gets the job done.

Light, the fastest particle/wave we know about, traveling at 186,282 miles a second in a vacuum, gets much

attention in “Zoom.” Despite this astounding speed, light still takes time to go from A to B. He points out that our “now” is always in the past; when we see something 10 feet away, that image isn’t now but from 10 nanoseconds before. The light we see from the Sun is 8½ minutes old, and the light from the nearest star not the Sun, Alpha Centauri, takes 4.4 years to reach us. Berman writes, “We see stars as they were years or centuries ago. Galaxies as they were millions or billions of years ago.”

Well-written, with 31 pages of notes and bibliography, “Zoom” makes us observe and think about our world and its movements – and it’s an enjoyable read.

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## **Charlene says**

Berman looks at the very ordinary and well studied concept of motion and applies a novel lens. His fresh perspective made reading this book really fun. It is written for anyone with any level of education in the sciences, including no formal education.

Chapter 17 provided the best explanation of entanglement/quantum vs relativity that I have ever read. Without overwhelming his reader with extremely detailed scientific information (most of the time, I actually prefer the heavy science), Berman provides a shockingly simple and yet shockingly complete explanation of how observation affects reality, the Einstein-Podolsky-Rosen paper that mocked quantum theory, the new experiments that demonstrate how spooky action at a distance is indeed real, and how it affects our perception of speed/light speed.

I crave novelty and get really excited when an author can serve up the same old stuff on a brand new platter, and every chapter of this book did just that. It was deliciously satisfying. Some of the subjects Berman addresses are:

- Motion itself. Temperature and motion are the same thing. True motionless means reaching a state of infinite cool.
- The universe did not have a big bang as much as slow motion explosion that you are still in at this very moment.
- (I love his humor) When Newton wrote the Principia, he "proved that the sun's gravity should make planets travel in elliptical paths, \*\*thus effectively awarding Kepler a posthumous 1600 SAT score\*\*." (emphasis added)
- Our scientific observations themselves are very self centered. Humans can only recognize patterns that are in close rhythm with their own heartbeats. This is why we can recognize the crickets chirp as a pattern, since it only deviates from the rhythm of our heart beat by about 50%. But, we don't recognize the owl hoot as a pattern because it is not in rhythm with our own heartbeat. Mosquito sounds like it is making a constant annoying noise, that is either an A or a D. The rubbing of their wings is indeed a distinct pattern but it is too fast for us to contact since it deviates too far from the rhythm of our heart beat.
- Boiling hot coffee in one state in the U.S. is not the same temp as boiling hot coffee in another state. The hottest coffee in Denver is 10 degrees cooler than the hottest coffee in Boston.
- The magic motion of hydrogen and oxygen (great chapter!)
- Unexpected facts about radiation (so entertaining)
- An excellent story of the personal life of a film/photography pioneer who set us on the road of developing the incredible movie watching experience we enjoy today
- The motion of cells, animals, and the universe at large (makes you appreciate your place in the universe)
- How we think we know space is flat (again, great, simple explanation)



My brain was so happy the entire time I read this book. A+

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