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Guest Post: Lisa Randall on Writing *Knocking on Heaven's Door*

by Sean

Lisa Randall is a friend and collaborator, as well as a science superstar. She is one of the most highly cited physicists

of all time, for a variety of contributions to field theory and particle physics, especially her work with Raman Sundrum on warped extra dimensions. Her first book, *Warped Passages*, was a major success, which naturally raises the question of what one does next. (Besides writing papers, I mean.)

So we're very happy to welcome Lisa aboard to guest blog about her *new* book, just out today: *Knocking on Heaven's Door: How Physics and Scientific Thinking Illuminate the Universe and the Modern World*. (Among other virtues, this book has the single most impressive collection of blurbers of any book ever written, from Bill Clinton to Carlton Cuse.) From personal experience I can verify that writing a book doesn't just happen; it's a tremendous commitment over an extended period of time, and once it's done there's not much chance to go back and change it. So deciding to write a book at all, and more importantly how exactly to target the writing, is a delicate and critical process.

While Lisa hasn't yet become a regular blogger, she is active on Twitter, where you can follow her at @lirarandall.

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In conjunction with the publication of *Knocking on Heaven's Door*, I thought I'd take advantage of Sean's kind invitation to post on Cosmic Variance to explain my motivations in writing my book. I haven't done a lot of blogging myself but I am impressed at the care and interest that go into science blogs. They are a way of sharing developments as they happen and an opportunity to have meaningful discussion of results.

I talk about a lot of science in my book. So I thought rather than summarizing it all—at least in this post—I'd focus on the question of why I wrote this particular book. I waited several years before even considering embarking on a second book project. I certainly didn't want to simply repeat the content of my previous book, and my own personal goal is always to branch out into new arenas—in this case into new types of writing–while still remaining true to my physics roots. I didn't know the exact book I was after but I did know some of the topics I considered important and timely.

These topics fell into several categories. First, I wanted to give an accurate picture of what is happening in particle physics and cosmology today—both with experiments and with theory. Particle physicists know this to be the era of the Large Hadron Collider (LHC), the machine that is colliding together protons at unprecedented energies to test the nature of matter and forces at smaller distances than ever explored. The interactions between theorists and experimenters is more intense than it has been during the time I've been actively pursuing physics. That is because everyone realizes this interactions are essential with these challenging experiments to get to the right answers. I wanted to convey the excitement and implications of the research taking place there, so when discoveries are made, anyone interested can understand what was found and what it could mean.

Cosmologists too find this is an important time and I wanted to share some of the interest in that major topic as well. One arena that both particle physicists and cosmologists are excited about are experimental studies of the nature of dark matter. Many find this topic perplexing, whereas even if difficult to tackle experimentally, the underlying idea really is not. I wanted to explain a bit how I think about dark matter and how experiments are searching for its feeble and elusive effects.

But I wanted to do more than just summarize the physics. The second important category of ideas I wanted to address has to do with the nature of science itself, and how active scientists go about advancing their field. After writing my first book, I was struck by how we take for granted the key underlying principles in our research, and don't always remember to share these basic, sometimes subtle, and critical ideas.

Although perhaps I shouldn't admit this, I had an even more ambitious agenda in mind. The ideas that underlie science are critical to rational thinking in general and should be widely known, even by those silly few who don't care about any specific science research topic. These ideas are broad and deep, and it would make a difference in many of today's debates if they were more widely understood and applied.

So interwoven with the physics story I wanted another story about the way science works. At this point, you might have surmised that the book I ended up writing included these topics, so rather than talk about what I wanted to write, I'll just tell about a few of the topics I cover in the book I eventually settled on.

I begin with some key ideas–frequently introduced through anecdotes. One such concept that is essential to the way physicists in particular go about their work is an "effective theory," which tells us to focus on what is measurable when making predictions. The underlying ideas here are the notions of "scale" such as energy or distance scales, and what it means to be right and wrong—both themes that resonate in other topics I'll later address. I'll later use scale to categorize what we know about matter— from the interior of an atom to the remote edges of the cosmos–and how the LHC and other particle accelerators, as well as various astrophysical probes, help us access successfully more remote scales.

The first section also expands on the nature of science, taking Galileo, whose work recently held its four hundredth birthday, as a departure point. Given my book's title, I figured I also had to address the relation of religion and science (though that is not what the title really refers to). Aside from the obvious historical relevance, what I was really interested in were the questions of why we have this debate, as well as how thinking about scale as a way of categorizing what science really tells us helps us understand and clarify some of the confusions

There are many other ideas about science including risk and uncertainty that are woven into chapters with more detail than you might even want about the actual physics. General discussions of truth and beauty and how physicists suggest models of matter or the universe, as well as top-down versus bottom-up physics and how model building contrasts with string theory are used to frame discussions of how we theorists go about our business. The book also delves into the role of creativity in science and the relation between science and technology–both important topics I enjoy thinking about.

Yes *Knocking on Heaven's Door* covers a lot of territory. But it's a big story, and one well worth telling And in case you were wondering, the title refers to accessing the edges of knowledge—a worthy goal for all of us.

September 20th, 2011 8:20 AM
in Guest Post, Science, Top Posts, Words | 45 comments | RSS feed | Trackback >

45 Responses to "Guest Post: Lisa Randall on Writing *Knocking on Heaven's Door*"

1. 1. *psmith* Says:
   September 20th, 2011 at 8:57 am

   Oh woe is me, there is no Kindle version.

2. 2. *Ron Crockett* Says:
   September 20th, 2011 at 9:25 am

   There is a Kindle edition, which I will download shortly.
   I have been waiting all year to read this book. Why? I believe Dr Randall is performing a most important function. Over my lifetime the creation of a well trained and educated society has lagged. But now with this book she is opening the gates for everyone and anyone to learn about everything.
   Good luck to all of you.

3. 3. *DBrown* Says:
   September 20th, 2011 at 10:03 am

   Galileo is not a good example to bring up – despite everyone knowing at the time that circular orbits for planets just didn't aggree with experimental observed data (after great efforts and valid experimental data being used) Galileo just KNEW that the planets did travel in circular orbits (the Greeks and many later experts weren't dumb, people.) So, despite facts Galileo still believed he planets did move in circular orbits – in his 'free fall' experiments and resulting laws of action/motion Galileo required circular motion for all his 'natural' objects when placed in motion (when not acted on by an outside force!) Talk about failure of the scientific method and getting it wrong because you believe something and refuse to accept observed facts. No wonder he refused to exchange ideas with Kelper since to acknowledge Kepler would be to admit he got it totally wrong and that he had tried to imposed his false beliefs on the real world. Yes, Galileo knew the planets went around the Sun but he refused to accept that the orbits weren't circular.

4. 4. *Roger* Says:
   September 20th, 2011 at 10:07 am

   The problem with the Galileo story is that he had no proof that the Earth went around the Sun, and his arguments were no more scientific than those of the Church. Motion is relative, according to 20th century relativity. He is not such a good example of science, and not a good example of dealing with religion.

5. 5. *Phillip Helbig* Says:
   September 20th, 2011 at 10:29 am

   I know this is off-topic but maybe I'll get a response here. I would really like a separate RSS feed for comments. Many of my favourite blogs have them. Especially on a blog with many comments like this one, one needs some method of following new comments which is better than looking at (in theory) *all* old posts.

   If I just can't find it, someone point me to it. If there isn't one, why not?

6. 6. *Joe Shobe* Says:
   September 20th, 2011 at 11:17 am

   Thanks, Sean, for inviting Lisa to your blog. I read the first book and loved it, and am excited about the goals of this book. Science needs to take on the real world; to take its rightful position in helping to better understand our environment and to set our direction and courses of action as a species. Gallileo as a starting point is fine.