The Morning News
Black and White and Read All Over

Wednesday, May 14, 2008
Currently: tossing the fried laptop into the *poubelle*
Today's Feature: "Meir Comes Clean" by Michael Rottman
Digest: "Mp3 Digest" by Erik Bryan

Birnbaum v.

Lisa Randall

Strings, branes, and baryogenesis—**ROBERT BIRNBAUM** is guided through contemporary science by one of the country's top theoretical physicists, Lisa Randall.

Albert Einstein's immense legacy to understanding the universe includes, for physicists, an image of the wild-haired, distracted scientist scratching indecipherable hieroglyphics on a blackboard. Blonde, slender, Harvard-trained theoretical physics professor and author Lisa Randall belies the stereotype of the bespectacled, pen-pocket-protected academic. "The fact is that some of it is at just the edge of knowledge and you are just going to have to go lock yourself in a room and do it. On the other hand it is not necessarily true that everyone is this weirdo image that you get for scientists. That's one of the things I want to get clear. There are some interesting people doing science," she explains. While the subject matter of her recent book *Warped Passages: Unraveling the Mysteries of the Universe's Hidden Dimensions* (included in the *New York Times*' list of 100 notable books of 2005) may not be the stuff of water-cooler conversations, part of its mission is to make the new concepts of physics warm and fuzzy to a wider audience.

The conceptual terrain of contemporary physics centering on rarified and exotic subjects such as string theory and warped geometry mapped by popularizers such as Carl Sagan, Briane Greene, and, now, Randall is rife with notions such as standard model observables, parallel universes, three-dimensional sinkholes, cosmological inflation, baryogenesis, grand unified theories, Kaluza Klein particles, extra dimensions, branes, and such. Randall readily acknowledges this in our conversation below. " It's true. It's very theoretical. One of the good things about writing a book was that it was really the first time I could talk to all my friends about it. It was a very different experience being able to relate."

Lisa Randall is one of the most cited theoretical physicists in last five years. "There is a confusion about science. We don't know everything right away. We have ideas and speculations and you might have a theory before you have a premise confirmed—experimental data, before you know what it means... at this point we know a lot of things and I spend a lot of my book telling what things we do know," she says. Good reasons for her new book.

Every so often I find it useful to venture into an area where I am a without much knowledge and understanding. And thus I need a skillful and sensitive guide to make such an adventure work for me. As I think our chat below shows, Lisa Randall and her eminently accessible book lucidly provided such help.

* * *

» **Email this**
» **Save this**

TMN Contributing Writer **Robert Birnbaum**, a bookish journalist, was born in Germany, grew up in Chicago, and lived for too many years in Boston. He is editor-at-large at Identitytheory.com and has also lived in New Hampshire. He recently returned to the Boston area with his blonde Labrador, Rosie—the reasons for which will be examined in his memoir in progress, *Just Talking: How to do Things with Words*. He may be found in print here and here, in *Bark* magazine, and in the Believer Book of Writers Talking to Writers, speaking with the non-pareil Jamaica Kincaid. And here too. All you hot-shot book editors and agents may want to ask him about his book idea. Before it's too late. Duendepublishing@gmail.com.

Also by Robert Birnbaum

- **Chip Kidd** (Birnbaum v.)
- **Movies for What Ails You** (Of Recent Note)
- **Arthur Phillips** (Birnbaum v.)

» **SEE MORE**

Also in Birnbaum v.

- **Chip Kidd** (April 2, 2008)
- **Arthur Phillips** (January 16, 2008)
- **Susanna Moore** (September 25, 2007)

» **SEE MORE**

Robert Birnbaum: Looking through the book's acknowledgements, you thank Cormac McCarthy.

Lisa Randall: Yeah.

RB: At first I didn't make anything of it—mainly because Cormac is spelled "Cormack."

LR: It was spelled wrong. [laughs] It's one of the many typos. It got copy edited in England first—which might be why they didn't see it.

RB: Striking to see someone like McCarthy is interested in reading on this subject. How did it happen that he read this book?

LR: It was complete luck. I have a friend, a scientist, who goes down to Sante Fe, and [met] Cormac; he is very interested in physics. My friend told him I was writing this book and he came back and said, "Cormac is interested in reading your book." And I thought, *Sure he is,* [laughs] and basically ignored him. I thought, *That's very nice*. I didn't know he really knew what he was up against. And this happened several times. And I never sent it. Finally, my friend said, "He's really interested—you should send it." So I sent it. And interestingly, Cormac doesn't use email, which is what I use. So I really had to talk to him and really nail it. And he called me pretty soon afterward and we had a really nice conversation. And then I didn't hear from him for a while; it turns out he was really busy. Then I got in the mail, basically, my entire manuscript edited. He had read every line, and basically every line had something in the margin, a correction or some comment. He really had read it thoroughly—in the final stages we were really behind schedule [it came out in England first]—and I had to frantically edit it at the last minute and his package came in after it was officially copy edited, so I wasn't sure how much I could change it. We had some really useful conversations and it was really nice—there was only so much I could change, but getting less clunky wording made it smoother.

RB: I thought part of the reason that you wrote this book was for the layman, which I would think made a writer's input valuable.

LR: Yeah—no one involved officially with the book had a science background, which I thought was a good thing—because if they got it, then anyone would get it. Cormac was nice—he's read a lot of this stuff, and he's such a good writer, and it was really encouraging.

RB: Had you read any of his work?

LR: I hadn't. But now I have. Obviously, it's very different.

RB: You're going to Geneva. Are you going to see the particle collider there?

LR: I am. I haven't actually seen it yet.

RB: And it's not operational until 2007. Why does it take so long to build?

LR: It's enormous. They use magnets that have not been built yet. The tunnel itself is 26 kilometers long.

RB: And the point of these experiments is to achieve so-called observable, measurable scientific proofs.

LR: There's no "so-called" in that.

RB: [laughs]

LR: This is science and it is recording things and you have to put together what it means. It is recording definite signals, what was there, what charges it had, what energy it had?

RB: I put the qualifier in because there are places where you use words like "believe" and "germ of truth" and language that is not absolute.

LR: This is a confusion about science. We don't know everything right away. We have ideas and speculations, and you might have a theory before you have a premise confirmation—experimental data before you know what it means. That doesn't mean we know everything. At this point, we know a lot of things, and I spend a lot of my book telling what things we do know. But there are things we don't know—like extra dimensions. I can tell you why I believe they exist and what it would require to prove they exist, but right now we are at stage where it's just speculation—interesting and promising, but it may not turn out to be right.

RB: So that's a difference between basic science and theoretical science?

LR: I wouldn't say basic science versus theory—science is a combination of theory and experiment and the two together are how you make progress. It's a basic misconception—experiments are always at the edge of what you understand theoretically. Almost always. So you are interpreting things, but measuring them at the same time, and trying to put it together to see which is a consistent hypothesis, which is a repeatable hypothesis, so when you do an experiment it conforms to the same interpretation the next time. So it's not that we know everything right away, but there are many things we do know, and because I am aware that the work on extra dimensions is speculative, I thought it was important to give the reader the things we are firm on. And it tells why we are speculating, how we got there, what are the questions we are trying to answer. So it's really a combination.

RB: It occurred to me that perhaps the best way to convey this information is not in book form. Both you and other scientists who have taken it upon themselves to try to make this rarified theoretical stuff accessible invariably seem to run into people who say, "I tried to understand this, but I got a headache."

LR: I think a book is a good way to do it. One of the reasons I chose to do a book—there are many advantages to books—

RB: I am not saying it's not effective, but some of the ways, when I tried to understand the phenomena you are describing, [when I] tried to imagine, I am led to the special effects and cinematic language that has the

possibility of approximating things we don't [encounter] or have not yet encountered. And also the possibility of using hyper-textual CDs.

People are not going into this field for the money.

LR: I thought a lot about this. I really wanted the best way to convey this information. There are a few things that make books good and a few things that make them not as good. It's harder to do visual things, obviously, and it's limiting—you have to have a logical order in which you understand things, whereas the kind of science I do, we are tying in many different things. On the other hand, I think we are forcing me—it was quite an exercise to try to turn it into some logical sequence, these ideas. For the reader, I've done—it was really a lot of work but it makes it easier to understand. Rather than them pulling in all these different threads, they can read it sequentially. The other advantage is you can go back and really go over the idea if you don't happen to get it the first time. With visuals you see it, that's it—you can rewind, but there is only so much information conveyed there. It helps in some way to stimulate imagination, but it terms of understanding fundamental concepts, they are actually not visual—some are and some aren't and you can be misled trying to put it too visually.

RB: Right. I'm not saying a video is the answer, but something that conveys the information on a number of levels.

LR: It's not so easy to go through different tangents. It's nice to have it structured and in an order where you can go back, and I have bullets at the end of chapters so you can see the key points—really trying to turn it into some logical thing you can follow is a big advantage. It doesn't mean that it does everything, but the other thing about a book is that you can put in the background information. Otherwise it's, "Let me show you just a cool thing we are thinking about." It's cool and looks neat but it's science-fictiony at that point. The question is, why is it science? What are the connections and what are the questions we are trying to answer? And you really want a book to say where are we going and—

RB: I am not going to argue against books. But scientists talk about things they call intuitive and I think, "Intuitive for whom?"

LR: That's absolutely right. The other interesting thing about a book is that I gave it to lots of different people to read and different people found [that] different metaphors and analogies resonated and different people found different things interesting. It's true there are a lot of different readers. Different people like different styles of writing. Again, that's something I thought a lot about, trying to appeal to many different people by including the details but also the broader-brush picture. Also, they come with different backgrounds, they know different things, so I wanted to have enough new stuff as well as background, and even for people who did know this, to know how I am thinking about the background. It's true it's a big range and not an easy thing to do.

RB: It was a nice touch to have epigrams from popular songs. That's what started me on thoughts of a multimedia approach.

LR: There definitely is room for that.

RB: A TV series.

LR: I don't object to that idea. I agree there are things that would come across better if you could talk them [out]. When I give a talk, there are things that come across more clearly—having good visuals would really help. The songs give the basic concept but they're also fun, a little bit of a reflection on language and just how we use words. I'm usually misappropriating them. I was having fun, what can I say?

RB: The image of the crystals that are used in a nonstick fry pan also was effective.

LR: That's a really fun example and it's different—a really immediate thing. And it really does resonate with people. In fact, I just ordered one. I want to use this thing, or at least have it to show people.

RB: You came on an interest in science early on.

LR: I was a nerd. I was a good student.

RB: That separated you out?

LR: Yeah, I grew up in a pretty typical semi-suburban neighborhood in Queens.

RB: No cheerleading for you?

LR: I don't think we had cheerleaders, but there were sports teams—I was definitely more into math and science than other kids, and studying.

RB: As a girl, that made you more weird?

LR: When you are younger, girls and boys go through it—in high school there are fewer girls [into math and science]. I didn't think about it that much. One of the nice things about math and science is it's obvious, you get the answer or you don't get the answer.

RB: At a certain point, the popular conception of scientists is that they are an odd lot and more so for certain kinds of physicists, not defined by gender.

LR: That is a really good point. It cracks me up when they talk about the anomalies, they forget that all of us are kind of weird—a weird bunch with some weird variations within.

RB: No doubt you have been asked repeatedly about Lawrence Summers' statements [about women and science].

LR: Yeah, I have been asked a million times.

RB: Is there a good answer?

LR: He shouldn't have said it. What can I say? It was not a good thing to say.

RB: Any changes since the hullabaloo?

LR: Some things have changed for undergraduates. Certainly structurally, there are new positions. I don't know how much things have substantially changed yet.

RB: Is the guild of theoretical physicists a small, intimate one where everyone knows what the others are doing?

LR: It's not that small. I don't know the numbers but there are thousands.

RB: Thousands?

LR: You go to a conference and there are hundreds, and that's just one conference.

RB: Is theoretical physics a lucrative field?

LR: People are not going into this field for the money. [laughs]

RB: In some fields there is not a huge disconnect with how one lives and what one does.

LR: It's true. It's very theoretical. One of the good things about writing a book was that it was really the first time I could talk to all my friends about it. It was a very different experience, being able to relate. Of course you have friends who are physicists, but [with] those who aren't, you can talk about sociology and but not about what you are actually doing. It was fun. I have friends who are writers, and it was nice to be able to talk about what I was doing and what they were doing.

RB: How receptive were people to you talking about such seemingly obscure stuff?

LR: It was fantastic. Obviously, I am only going to talk to the ones that are interested, but some were more interested than others, some have trouble with science more than others. One of the really interesting things was to see—I have friend who studied English but just how her logical mind could absorb these ideas and the questions she would ask when she read it were good questions, showing that she was really was getting it. It was a revelation to me what people are thinking when they don't know it. They were very excited about some of the analogies—it was new ways of thinking about the world. It's not just the science, and it was very rewarding.

We need science the way we need literature. I would go that far.

RB: Do you see evidence of the overcoming of biases that science is not a creative endeavor?

LR: The fact is that some of it is at just the edge of knowledge and you are just going to have to go lock yourself in a room and do it. On the other hand, it's not true, necessarily, that everyone is this weirdo image that you get for scientists. That's one of the things I want to get clear. There are some interesting people doing science. And it's true that sometimes the science itself is abstract, but they are also interested in real-world issues and they are connected—so it's people that are connected even though the research, in some ways, is very ethereal.

RB: Is string theory and extra-dimensional modeling taught in American high schools?

LR: No—do you know what I found out when I was writing this? Not even quarks are taught in high school. Forget string theory. String theory, we don't know if it's right yet. It's an abstract theory we are working on, and we are at the edge, but quarks have been established. We know about the up and down quarks, which sit inside protons and neutrons. When I was writing my book it came up. I said the model you learned in high school was of the atom and a friend said they probably learn quarks now—[but] they don't learn about quarks in most places. That's part of the standard model.

RB: Has physics education kept up with the changes in the science?

LR: I don't really know the details of lower grades' education, but it's surprising to me that [quarks] have been around since the '70s, experimentally established—even that isn't learned, so forget string theory.

RB: Kids coming into college studying physics are shocked?

LR: People studying physics—they read books like my book, they know stuff. I'm saying for the average person, its not part of a general education.

RB: What is part of the general education? [laughs]

LR: I don't know. I'm not saying they are not teaching it [physics]. It's just not up to date.

RB: If science isn't up to date, what is it?

LR: It's still important to learn about the atom. I actually don't know the details.

RB: One real-life application of science is the current debate about intelligent design.

LR: Yeah, I just wrote a piece for a book by John Broadman about that.

RB: Are there any scientists who have affirmed this notion of intelligent design?

LR: [laughs] It's almost tautological. The claim is that there are some but it's hard to imagine—

RB: No one will recognize you as a scientist if you argue pro-intelligent design.

LR: Right. It's not science—that's all there is to it.

RB: I find issues of time and duration interesting—your primary focus is on concerns about gravity.

LR: Einstein put together time and space—well, actually, it wasn't initially his idea—but in the space/time continuum. So we talk about space/time geometry—so in some ways we are treating space and time on equal footing. But there are many aspects of time we just do not understand. That's the thing about writing a popular book: You realize the things you understand because for those you can give a really simple explanation. But some things about time I just don't know how to give simple explanations for, even though I can tell you mathematically what's going on. In terms of gravity, I got interested in studying gravity more through a particle physics route. Fundamentally, I was doing theoretical particle physics. The reason I got interested in gravity was

this idea that extra dimensions might actually help explain phenomena about the particle that we do measure in labs. I say "we," I mean my experimentalist colleagues, so the connection of the overall geometry of space/time and the things that we actually experience or test or detect got me interested. But in the process, my collaborators and I discovered things no one else had discovered about what happens in the geometry of space/time, extra dimensions that you don't see. No one had thought that was possible, but it could explain why gravity is so weak for us—why we experience gravity as so weak as compared to the other fundamental forces.

RB: Is that true on Jupiter? When you us say weak, you mean measurably weaker?

LR: Really weak at a fundamental level. The classic example is that you can pick up a paper clip with a magnet because the magnet can compete against the entire earth. So if you have fundamental particles this is just a question about the fundamental force of gravity. The fundamental strength for elementary particles is far weaker than other forces we know about, the electromagnetic weak and strong forces, and so the question is, what makes it so weak? Why is it so much weaker at a fundamental level? And that would be true on Jupiter or here.

It's not impossible that art gives new ways of thinking about things, but at the end of the day you have to do science for it to be science.

RB: Do people ask you what the point of this is—as in, "I live my life every day without needing to know about strings and extra dimensions and branes. [A brane is a membrane-like object in higher dimensional space that can carry energy and confine particles and forces.—ed.] What do I need this stuff for? Why clutter up my head?"

LR: You don't need to. But it is one of the things that make us interesting as human beings, to try to understand the world around us better. Ultimately, who knows if these things have application—I'm not going to speculate one way or the other.

RB: Wow, this is something important to you, and you wouldn't argue for its importance?

LR: How many things that people do, do we really need—out of curiosity?

RB: Well, I think we need literature.

LR: You think we need literature?

RB: Yes.

LR: We need science the way we need literature. I would go that far.

RB: [laughs]

LR: It's a different definition of "need." I guess I wouldn't say, "need."

RB: Not in the way we need oxygen.

LR: There are many people who survive quite well without having literature in their lives.

RB: I would argue about what "survives quite well" means.

LR: That's right. As humans, we do need to keep pursuing an understanding of our universe.

RB: Does it strike you that there is a greater interest in collaborations between arts and science?

LR: Since I published my book, I have had a number of contacts from people doing art or literature about overlaps. Definitely people would like science to inform their work more.

RB: What do you think about that?

LR: As metaphor—as long as it's very clear what science is, what it's not—I think it's great. Obviously, for TV and literature, having a better-informed public about science is fantastic, but in terms of art it gives new ways of thinking about things.

RB: Can I translate that to mean that, whatever the result of these collaborations, the product is not science?

LR: It wouldn't be science.

RB: It would still be art—science and art equals art.

LR: It's not always true. In Einstein's era, philosophy did inform science. And it's not impossible that it [art] gives new ways of thinking about things, but at the end of the day you have to do science for it to be science.

RB: Speaking of new ways of thinking, what are the benchmarks of new thinking since, let's say Spinoza?

LR: [laughing] Spinoza? Um—

RB: Really new, fundamentally new. Evolution?

LR: In physics, general relativity and quantum mechanics were new ways of thinking about things.

RB: That's the early 20th century. Let's go back further. So from Newton to then—no great discontinuities?

LR: Well, there were things in between. The idea of entropy—having entropy and that it increases. That was really against the religious grain—the idea that there is randomness increasing in the universe, in some sense. People did not like that. Or even that things were evolving at all. We still see that the debate both in the context of the physical sciences and also in plant and animal life. So evolution was obviously radical—but quantum mechanics—the idea that not everything is completely predictable, that there are some measurable quantities that if you knew one you may not know the other as well. The idea of having probabilities of making various measurements, then just the idea that everything is quantized at a fundamental level—Quantum mechanics is in some ways the most radical revision; it was saying our most basic assumptions were wrong.

RB: Now some 30 years ago string theory—is it a mirror image—

LR: We don't know if it is right. But if it is right, it also is very radical. The idea that fundamentally it's not just

elementary particles but that we can have fundamental oscillating strings and particles are those oscillations.

RB: What would be proof?

Probably the fact that I don't look like a scientist works against me in some ways, too.

LR: It's not clear there will be proof. You might have proofs of elements of string theory, like extra dimensions or supersymmetry. It could be we are very lucky and the kind of warped geometries that I talk about, where space/time is so warped it turns out what happens is that things get rescaled, and if we are very lucky there could be rescaling so that things associated with string theory—particles or forces that we thought were too heavy, too far beyond what we could measure could—So what I mean by that is we have these theories but we have to connect the theory to the world. So there are lots of choices that the theory itself presents or we are making because we don't know what the connections are. There are many possible predictions at this point and we need to know more to know which predictions are right. I can say there are extra dimensions out there. "How many are there?" I could say there are branes out there. "How many? Where are they?" So there are basic assumptions going into what it actually predicts. So when I say we are lucky, it has to be that it's the particular assumptions that lead not just to assumptions, but the real world has to manifest itself according to those assumptions in order for certain things to be measurable; otherwise, we don't know how they would be. There could be cosmic strings also if we are lucky—as well, because of warping.

RB: What are M strings?

LR: Theory. It incorporates string theory. What was discovered in the 1990s was that string theory is not just a theory about strings. It also involves other objects called branes, membrane-like objects and hard natural states. It also was realized that different versions of string theory were secretly the same. They were what we call "dual" to each other, and so M theory is this theory that encompasses all the known aspects of so-called string theory. But it involves things we don't understand yet. So M theory is the modern version of string theory.

RB: When you say we, some people understand parts of it but—

LR: No one understands all of it well enough to make predictions.

RB: What is the end game or goal? What kind of verifiability is there in the models you create?

LR: In some of them, not in all of them. That's what is so exciting. If we really do explain the weakness of gravity through this warped geometry of mental space, the idea of gravity being strong elsewhere but weak where we are—if this is true, there are measurable consequences. In fact, there are particles that are called Kaluza Klein, named after people who first thought about extra dimensions—particles that travel in extra dimensions and have energy associated with the fact that they travel in extra dimensions, which looks to us as if they have mass. They are particles that look like particles we would expect, except they are heavier.

RB: They look like they have mass?

LR: Right. In some sense they do have mass, $E=MC^2$. It's the same thing; there are extra mass particles that are detectable that would tell us that these extra dimensions exist. That would be very exciting.

RB: Would you like something in physics named after you?

LR: It already is: the Randall-Sundrum Model, in warped geometry.

RB: When you talk about extra dimensions, why not posit there are an infinite number?

LR: You can, but where do you get science out of it? One reason is string theory, which perhaps guides us—the real reason is that we are looking for new conceptual phenomena, new phenomena to occur, and so we don't necessarily need an infinite amount to find new phenomena. So there is nothing to be gained from the scientific perspective.

RB: Except that not saying infinite will lead to someone asking how many?

LR: People always ask how many, and, in fact, one of the research projects I am involved in is trying to understand experimentally how we will determine how many there are. That's just a science question. I don't know the answer. If anyone told you, they are not telling you the truth.

RB: When you are trying to deal with these problems, how do you grasp them—words, images, equations?

LR: I don't know the answer to that. It's sort of pictures and equations. It's words—it's ideas. I don't know. It could be looking at an equation and thinking this implies that. Sometimes it happens that way.

RB: And then of course the work is to convert that to something repeatable and understandable, in a public language.

LR: And also you might have some inkling, some clue that something works. Then you have to go back and see if all the details work. That's how we found the extra dimensions—we had strong clues that it worked, and we found evidence that it would look like our gravity. But what about all the other stuff? Does that mess up your interpretation? So you have to go back and see if it is all consistent. And are there consequences that you can predict in terms of experiments in some cases?

RB: There are scientists who make the claim that there are certain windows of one's life [during] which you may be most capable and creative. Do you think about that?

LR: My joke is that they were always talking about guys when they said that. [both laugh] They don't have enough statistics on women to know. Nah, I don't know. You look around the field and some older people are doing good work as well as younger.

RB: I had asked Brian Greene, and he said it might be that many physicists concentrate on very small areas and that could affect them.

LR: A couple of things. One is that your area may no longer be the exciting area—so you might get bored. So that's true. One thing that keeps you youthful is constantly going out and learning new things and doing new

things. That's probably right. There are also just practical things. We get other things in our lives as we get older. You have more time on your hands. I don't know that your brain changes.

RB: One stereotype of scientists is that they don't allow real life in.

LR: Some do. Obviously you make trade-offs, but I don't know what that explains.

RB: I have sense that you are really busy. Is that true?

LR: [laughs] Yeah.

RB: And that's because the world of theoretical physics is such an active, overheated world? Or is it you?

LR: Kind of a combination. I am doing several jobs now. I am a professor, so I teach. I am doing theoretical physics, so I do research, and I have a book out, so I'm trying to tell people about the book and so I am doing interviews like this. And I am traveling and giving talks, and any one of those things could be full-time, and all together it makes you busy.

RB: One of the problems that you set up for yourself is that you don't want to become such a popularizer that you oversimplify or lose the complexity of these ideas—

LR: In an appendix—you can read it without the math.

RB: I'm reminded that a lot of the verifiability of this stuff is mathematical.

LR: Sure. I don't know about verifying, but certainly at the first level it better be that the math all works. That doesn't mean that it agrees with the real world, and it's important to check that, too. So it's both.

RB: So what's next?

LR: Research. [laughs]

RB: Does it involve that particle collider in Geneva?

LR: Not literally. I'm doing theory but I'm thinking about the things they might see in the future in addition to cosmology, and I am thinking how the universe has evolved, and how they might see evidence of that, too. So part of it is researching, part is various projects I'm involved in related to popularizing science or whatever. So there is plenty of stuff keeping me busy right now.

RB: People aren't knocking your door down to put you on TV? A smart woman, articulate, photogenic—

LR: Thank you. I've had some contacts but no one knocking my door down. Probably the fact that I don't look like a scientist works against me in some ways, too.

RB: Are there many science programs on TV or cable other than *Nova*?

LR: That's the other thing: I was on some *Nova* briefly. There are more outside this country—there's BBC's *Horizon* and things like that. There isn't a whole lot. It would be nice to have more.

RB: There are only a handful of science popularizers.

LR: It's a really important thing to do. And for me, for many reasons. I am representing scientifically, I am talking a little more about a connection to experiments. One of the really nice things about extra dimensions is that it's very theoretical and intriguing, but there is a possibility of measuring things, so it's not just this smart person telling you all this idle speculation. I am really telling things that we might hope to measure and why we care about these experiments.

RB: It occurs to me that you are using a word [dimensions] that people think they understand the meaning of.

LR: [chuckles] That's true, too. That was one of the shocking things when I gave my relatives the book. I told that the stupid little story in the beginning of the book to make sure people knew what I meant. People have many different ideas of dimensions.

RB: [laughs]

LR: It's important to realize that not everyone looks like the image of a scientist that people have and that there are other reasons that is important to do popularization, but also a lot of the science issues that come up—like intelligent design—it's important that there are people who can speak on them. So it's an important thing to do [popularize] these days.

RB: I think there is still a bias that suggests that science is not a creative endeavor—though looking at the things you are talking about, it escapes me why that bias exists.

LR: The parts of the book I like the best was when I got to be creative. The use of analogies, how to put it all together—that was fun.

RB: Do you have any interest in writing that's not scientific?

LR: Sort of a back-of-the-mind thing. Things you sort of dream about, but I am not going to sit down tomorrow and start writing my great novel.

RB: What are you doing besides flying off to Europe?

LR: For the immediate future: research, conferences, some consulting. In the long term, I don't know yet.

RB: Do you read fiction?

LR: I do. I love fiction. I read all sorts of things. Right now I am reading a novel by my friend Chris Miles, which is fun. It's sort of a mystery thing.

RB: And might you be afraid to take on writing a novel because it's hard and [you have] a fear of failing?

LR: Even writing this book was something of a risk. I was very successful in physics and something of my reputation would be on the line with this book, so I wanted it to be good. Writing, at least for me, is pretty all-encompassing and I want to have my life back for while. Right now, I just can't imagine writing a book at this

point. Maybe soon, but right now I would like to be doing the things I like to do. And also have time to think about ideas and interact with the world. It's not something I am going to rule out, but we'll see if I can actually do it. There are some pretty talented writers out there.

RB: OK, then. Thank you.

LR: Thank you.

—Published February 9, 2006