Monday, May 29, 2006

Tying it together with string theory

Scientist may have solution to physics quandary

By TOM PAULSON
P-I REPORTER

If you can't sleep at night worrying about gravity's ongoing conflict with the other three fundamental forces of nature, Lisa Randall may be able to help.

Randall, a theoretical physicist at Harvard University, has become one of the most influential scientists in the world struggling to resolve perhaps the most vexing problem in all of physics -- the search for a unified "theory of everything."

zoom

Paul Joseph Brown / P-I

Theoretical physicist Lisa Randall.

Yes, it sounds silly. Words often fail when trying to describe this esoteric and often count erintuitive branch of science. But the basic problem is easy to grasp: Gravity, as Einstein described it in his general theory of relativity, doesn't jibe with how matter has been observed to behave at the level of sub-subatomic particles.

The other three fundamental forces -- electromagnetism and the strong and weak nuclear forces -- deal with this realm in a field known as quantum mechanics. Gravity and quantum mechanics pretty much cover the way everything works, at least in terms of physical reality. Both have been proved experimentally.

But get them together in the same room (a very tiny room where these forces should all be expected to have a fairly equal say in how matter behaves), and they just don't get along.

In 1999, Randall and Raman Sundrum at Johns Hopkins University proposed a possible solution to this conflict -- the existence of heretofore unseen, extra dimensions in space. Rather than accept the constraint that the universe must be as we know it -- a three-dimensional space with the added dimension of time -- Randall and Sundrum submitted a conceptual and mathematical framework positing a universe of 10 or 11 dimensions. Within such a theoretical framework, gravity and quantum mechanics start to jibe.

The Randall-Sundrum model sent shock waves through the physics and cosmology community. It incorporated some aspects of string theory, another theoretical attempt at unification that contends the fundamental units of matter are strings rather than particles. Their work has become among the most frequently cited in all of particle physics. And Randall, 43, partly because she is a woman in a field dominated by men, has become something of a celebrity scientist.

The Seattle P-I recently caught up with her at Café Solstice in the University District. She is speaking Tuesday about her new book, "Warped Passages," at the Town Hall Seattle Science Lecture Series.

P-I: Let's cut to the chase here. How do we know that you and the other brainiacs aren't just making all this stuff up?

LR: Well, at this point, I suppose we are just making it up. All we can show is that our ideas are consistent and see why they might be true. But until experiments find the evidence, it is just speculation. Still, we have good reasons to think they might be true.

P-I: In the book, you cite evidence many of us have in our kitchen that hint of extra-dimensional space -- the atomic arrangements of some non-stick metals used in cooking pots. Could you explain that again?

LR: Yes, the quasicrystals. Crystalline structures tend to form according to regular

patterns. In this case, there is no recognizable pattern when considered in three dimensions. But when these quasicrystals are looked at as if in five dimensions, there is a pattern. Do we know that five dimensions exist? No. But we can explain this pattern by invoking five-dimensional space. It's intriguing.

P-I: You appear to be plenty busy these days revolutionizing physics. Why take time out to write a popular book?

LR: A lot of times this stuff is presented as beautiful mathematics and all that. It can seem disconnected from reality. I wanted to make it clear that the speculation is drawn from experimental evidence, from observations. I want people to understand where these ideas come from, in a way that's entertaining and readable. I think many people enjoy the notion that there's more out there ... that we are still learning new things.

P-I: It certainly is entertaining, like when you compare the constraints of living in a black hole to the plight of women living in Saudi Arabia or the uncertainty principle to the Florida presidential election results in 2000. How hard is it to translate the science into words we regular folks can understand?

LR: The hardest part was in explaining some of the particle physics, because so much of it is impossible to visualize. I get distracted easily so it comes naturally to me to tell jokes and stories to help people understand the physics. You can be serious about this stuff without being too earnest.

P-I: Whether you like it or not, you appear to be something of a celebrity scientist these days. The fact that you're a woman in a male-dominated field -- and that you bear some resemblance to Jodie Foster -- is frequently noted in news stories. How do you feel about all that?

LR: I think this whole focus is pretty weird. I mean, how many people who were interested in Steven Hawking's book also talked about how he looked? Nobody in a million years would have asked him about that (laughs). I think it's just weird that people think they can ask me about my appearance in the context of talking about the science. I don't think I'm any kind of celebrity. I think what's interesting to most people is the science.

P-I: What are you most interested in these days?

LR: Most of us are really looking forward to the experiments that will be possible with the LHC (Large Hadron Collider, the next bigger particle-smashing accelerator being built in Geneva and due to begin operation in 2007). Some of the particles we believe travel in higher dimensional space could be detectable in these experiments. But it's not just about looking for new particles; we're looking for new laws. It's really exciting.

THE EVENT

Lisa Randall, author of "Warped Passages: Unraveling the Mysteries of the Universe's Hidden Dimensions," will speak at 7:30 p.m. Tuesday at Town Hall, Eighth Avenue and Seneca Street. Tickets are $5 at the door.

P-I reporter Tom Paulson can be reached at 206-448-8318 or tompaulson@seattlepi.com.

Seattle Post-Intelligencer
101 Elliott Ave. W.
Seattle, WA 98119
(206) 448-8000

Home Delivery: (206) 464-2121 or (800) 542-0820
seattlepi.com serves about 1.7 million unique visitors
and 30 million page views each month.

Send comments to **newmedia@seattlepi.com**
Send investigative tips to **iteam@seattlepi.com**