Physics at the end of its string?

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Saturday, September 30, 2006

The Trouble With Physics: The Rise of String Theory,

the Fall of a Science,

and What Comes Next

By Lee Smolin

Houghton Mifflin,

392 pages, $34.95

In 1990, I travelled to a remote resort in northern Sweden to attend a symposium on The Birth and Early Evolution of Our Universe, at which 30 of the world's leading physicists pondered the riddle of cosmic creation. One day, everyone climbed into a bus and drove to a local town to hear a local church choir. When we entered the church, it was already packed. As this scientific priesthood strolled down the centre aisle, led by the paralyzed physicist Stephen Hawking in his motorized wheelchair, the congregation started clapping, tentatively at first, then thunderously. In that thrilling moment, I thought physics had a chance of usurping religion as our source of absolute answers about existence.

No more. Over the past 16 years, physicists seeking answers to the Big Questions have become lost in a fantasy realm of higher dimensions and parallel universes with no grounding in empirical evidence. This is not just my assessment. It is also that of physicist Lee Smolin, author of two previous books on theoretical physics and a founder of the Perimeter Institute, a scientific think tank in Toronto. *The Trouble with Physics* is not the only new book that finds fault with contemporary physics -- others include *Hiding in the Mirror*, by physicist Lawrence Krauss, and *Not Even Wrong*, by mathematician Peter Woit -- but it is the most devastating.

Over the past 25 years, Smolin acknowledges, he and his colleagues "have made no real headway" in understanding nature's laws. Experiments have "mainly served to confirm existing theory. When something like this happens in sports or business, it's called hitting the wall." Meanwhile, many of the brightest minds in physics have become enthralled with string theory, which attempts to unify quantum mechanics and general relativity and to account for all of nature's forces and particles. Touted as a "theory of everything," string theory holds that reality is woven out of infinitesimal strings, or, in newer versions, membranes, vibrating in a hyperspace of 10 or more dimensions.

Smolin once considered string theory so promising that he wrote 18 papers on it. Eventually, however, he became disillusioned. Over the past decade, researchers realized that the theory comes in a virtually infinite number of versions, each of which "predicts" a different universe. The upside, Smolin notes, is that string theory "cannot be disproved," because it can account for every possible fact. "But the reverse also holds. No experiment will ever be able to prove it true."

Some string enthusiasts, notably Leonard Susskind of Stanford University, have tried to impart a positive

spin to this surfeit of predictions. In his recent book *The Cosmic Landscape*, Susskind conjectures that all of the universes allowed by string theory actually exist, forming an infinite "landscape" of universes with different forces, particles and even dimensions. To explain why we find ourselves in this particular cosmos, Susskind invokes the anthropic principle, which holds that if our universe did not have the structure we observe, we would not be here to observe it.

The landscape proposal, Smolin contends, is as scientifically vacuous as the notion of intelligent design. As if that analogy is not enough to enrage string advocates, Smolin argues that the theory's popularity has less to do with empirical evidence than with academic politics. String theorists have seized positions of power at leading universities, controlling appointments and grants, particularly among young, up-and-coming physicists. "String theory now has such a dominant position in the academy that it is practically career suicide for young theoretical physicists not to join the field."

He accuses string theorists of "groupthink," in which members of an "in-group" strive for unanimity by suppressing internal dissent and dismissing external criticism. Smolin notes that groupthink led to disasters such as the Bay of Pigs invasion, the Challenger accident and, most recently, "the Bush administration's rush to war on the basis of a false belief that Iraq had weapons of mass destruction."

Smolin pleads with his colleagues to explore alternative theories of everything, including twistor space theory, an invention of British physicist Roger Penrose; doubly special relativity, proposed by Portuguese theorist João Magueijo; and loop quantum gravity theory, to which Smolin has contributed. Acknowledging that "no idea yet has that absolute ring of truth," Smolin also calls for "a radical rethinking of our basic ideas about space, time and the quantum world." Funding agencies such as the National Science Foundation should also encourage greater diversity of approaches, including long shots. With these steps, Smolin says, physics will generate the fresh ideas it needs to break free of its current impasse.

Although I admire the authority and passion of Smolin's diagnosis, I disagree with his prescription. What physics desperately needs is not new ideas but hard experimental data that can test ideas or inspire new ones. But these data are costly. Smolin does not even mention by far the most important event in physics over the past 25 years: the U.S. Congress's cancellation of the Superconducting Supercollider in 1993 after its projected costs ballooned to more than $10-billion. The Large Hadron Collider, which will be the most powerful accelerator in the world when it comes on line in Switzerland next year, will fall many orders of magnitude short of the energies needed to probe directly the micro realm where superstrings supposedly dwell.

Politicians and the public have become increasingly reluctant to pay for accelerators large enough to probe smaller distance scales and higher energies, where genuinely new phenomena might be discovered. The reluctance is understandable. Hawking, who led that stirring procession of physicists in Sweden back in 1990, once promised that physics would help reveal "the mind of God." But the "explanations" that physics offers are so abstract and mathematical that only an elite corps of cognoscenti can understand them.

Moreover, theoretical physics is no longer yielding world-shaking applications such as lasers, transistors, nuclear reactors and nuclear bombs. Little wonder, then, that funding for physics has stagnated while it has soared for biological research, which can help us not only understand but also heal our complicated selves. In other words, physics is in even bigger trouble than Smolin lets on.

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CORRECTION

The Perimeter Institute for Theoretical Physics is in Waterloo, Ont., not in Toronto as appeared in a book review Saturday.

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