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'IF YOU PIMP THE UNIVERSE, YOU'LL RUIN IT'

DAN FALK

How can scientists explain cosmic theory in a way the rest of us will

understand? Dan Falk goes to a special gathering at the University

of Toronto and watches them try

Jonathan Sievers gives new meaning to the phrase, "He's got the whole world in his hands." True, the beach ball he's holding looks like a globe. But the blue and green pattern on it doesn't represent Earth's continents and oceans -- it's the radiation left over from the big bang.

So, really, Dr. Sievers, a senior research assistant at the Canadian Institute for Theoretical Astrophysics (CITA), has the whole universe in his hands.

He is also waiting for a rather offbeat science lecture to get under way. Entitled "Pimp My Universe: Souping Up the Cosmic Ride" by its young organizers, the event is designed to bring together University of Toronto scientists, students and the public for a lively panel discussion featuring Dr. Sievers and three other U of T astronomers. Afterward, there will be a question-and-answer session covering everything from string theory to the search for extraterrestrial life.

Each panelist has been asked to explain a specific "slice" of the cosmic hierarchy, from the cosmos to galaxies to stars to planets -- in no more than five minutes. Dr. Sievers starts by asking the audience, a mostly young crowd of about 75, to imagine what they'd do if Godzilla suddenly appeared.

"You look at Godzilla and you scream," he says, "and you run directly away from Godzilla as fast as you can." Over time, he explains, those who run the fastest are well away from the beast, while the slowpokes are still in danger of being devoured. The effect is rather like what the galaxies that make up our universe are doing, in the aftermath of the big bang explosion.

He later admits that the analogy isn't perfect -- it suggests that the big bang took place in some specific, central location, when in fact it was an expansion of space itself -- but it's not bad for a five-minute intro. And it's a lot more vivid than the dots-on-a-balloon analogy usually offered.

Of course, the universe has cooled a great deal in the 14 billion years since the big bang -- cool enough that the primordial radiation from that era now appears as a microwave "glow" spanning the entire sky -- the very glow displayed on Dr. Sievers's trusty beach ball. "This," he says, holding it aloft, "is a snapshot of the universe, about 400,000 years after the big bang."

The task of explaining galaxies falls to Bob Abraham of the Department of Astronomy and Astrophysics, who gives a crash course in how gravity works and how stars cluster into galaxies. Jonathan Dursi, a CITA post-doctoral fellow, explains how stars are born and how they die.

Finally, CITA director Norm Murray explains how planets form from clouds of gas and dust into, at least in one case, a habitable world.

The actual pimping, such as it is, comes from moderator Karen Kelly, who asks what would happen if we tweaked the strength of gravity or some of the other physical constants that govern the cosmos. Could we spruce up the universe by changing bits and pieces of it, in the same way that we might spruce up a Camaro by adding racing stripes?

It turns out, explains Dr. Abraham, that we can't: If any constant factor were altered by more than a few per cent, the resulting universe wouldn't contain the stars, planets and even the chemical elements needed for life.

"Don't pimp the universe," he concludes. "If you pimp the universe, you'll ruin it."

The panelists have occasional differences of opinion -- for example, on the merits of string theory. Dr. Murray describes the much-hyped concept as our "best guess" at how relativity and quantum theory may be reconciled into a Theory of Everything.

Dr. Abraham counters that it "could also be a total load of crap." Unless string theory makes concrete, testable predictions, he says, it is more like philosophy or religion than science.

Some in the audience have obviously been reading up. They ask about the "inflation" model of the big bang, the "slingshot" method of sending planetary probes to the outer solar system, and the puzzle of why our universe is dominated by regular matter rather than antimatter. Others are content to sit back and absorb the weighty ideas.

Whether universes are better pimped or un-pimped, sessions like this show just how challenging it can be to explain complex science to the rest of us. It's something that all scientists should work at, Dr. Murray says, but not everyone succeeds.

His own work, for example, is highly mathematical, but with effort the equations can be interpreted and turned "into English," he says. "Once you've done that, it's not so hard to explain the science to the public."

Bridging this gap benefits the scientist as well as the layperson.

"It's difficult to say you've really understood something if you can't explain it to a non-specialist," Dr. Sievers says. Analogies like his Godzilla comparison can be useful, but "it's a challenge to come up with good analogies that accurately reflect the physics," he says.

With effort, however, just about anyone can understand how the universe works. "The basic picture is not that hard to explain."

Dan Falk is a science journalist based in Toronto.