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Redefining gravity: UCT professor shakes up the cosmos in inaugural lecture

Professor Amanda Weltman Photo: Nasief Manie

Using the radio sky as a tool could revolutionise the way we understand the universe, opening up new possibilities for scientific exploration, says the University of Cape Town's Professor Amanda Weltman.

Professor Weltman, the head of High Energy Physics, Cosmology & Astrophysics Theory Group and a leading figure in theoretical physics, delivered her inaugural lecture recently titled "From the Laboratory to the Sky: New Windows on the Universe."

Professor Weltman has achieved global recognition for her contributions to the field. With over 10 000 citations and numerous accolades to her name, she was promoted to full professor in 2020, further cementing her place as a trailblazer in the realm of physics.

In her lecture, Professor Weltman reflected on the pivotal role her parents played in shaping her academic journey, both of whom were passionate about mathematics. She explained that her approach to theoretical physics is rooted in three key pillars: mathematics, physical intuition and creativity. These principles, she said, were fundamental to tackling the profound questions that lie at the heart of her field.

Taking the audience on a journey through the cosmos, Professor Weltman explained how her work spans from the minute vibrating strings of matter to the vast expanse of the universe. "You will learn about chameleon gravity, a novel theory of gravity I developed as a PhD student," she said, referring to her ground-breaking work, "and the many efforts over the years to discover its effects in laboratory and astrophysical observations."

She added: "We only really understand less than 5% of the total energy of the universe. Ninety-five percent of it is dark ... We call it dark matter and dark energy simply because it doesn't interact with light."

In addition to her work on chameleon gravity, Weltman discussed her recent research into fast radio bursts and the immense potential they hold for fundamental discoveries in physics.

UCT Vice-Chancellor Professor Mosa explained the importance of inaugural lectures. "Inaugural lectures capture in one moment the long, arduous journey that [the scholar] has travelled to get to where they are. For the new generation and next generation of scholars, they also get to see what it takes to get to this point," Professor Moshabela remarked. He noted that these occasions provide an opportunity for the university community to celebrate the scholar's work and its broader impact on the world.

Professor Weltman's academic career has been defined by her ability to think creatively and ask the right questions at the right time. After earning her PhD under the mentorship of renowned physicist Professor Brian Greene at Columbia University, she spent time at the University of Cambridge as a postdoctoral research associate. In 2007, she returned to South Africa to join UCT and later founded the HEPCAT group, now a hub for groundbreaking research.

Throughout her career, Weltman has received numerous accolades, including the Meiring Naude Medal and the Elsevier Young Scientist Award. In 2021, she was awarded the prestigious South African Research Chair in Physical Cosmology, a recognition of her immense contributions to her field.

Professor Jeff Murugan, UCT's acting deputy vice-chancellor for research and internationalisation, commended Professor Weltman for her academic achievements and ability to balance the demands of research, teaching and mentorship. "She is a role model in how she balances the different aspects of her life; never letting one responsibility overshadow another but instead showing us all how to weave together family, mentorship and scientific pursuit in a way that enriches them all. Only a select few of us will ever have the privilege of being able to ask the right questions at precisely the right time. Amanda is one such rare scientist," concluded Murugan.

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