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Universe is expanding at ever-accelerating pace – UCT PhD graduate

Research conclusions will help ensure accuracy of readings by MeerKAT and SKA

The universe is not merely expanding but is doing so at an ever-accelerating pace, according to University of Cape Town PhD graduate Obinna Umeh.

Umeh says: "About 70% of [the universe's] rate of expansion is determined by dark energy and the larger percentage of the rest is determined by dark matter."

Apart from being able to answer some key questions of great academic importance in cosmology, the essence of Umeh's research is to establish a formalism for quantifying cosmological parameters in a universe filled with all kinds of structures.

Umeh says: "My PhD results show that the dynamics of structures in the universe have a non-negligible effect on how the universe evolves and that if such an effect is not properly taken into account, it could jeopardise precision measurements of some of the cosmological parameters by the next generation of radio telescopes, like MeerKAT and SKA (Square Kilometre Array)."

His PhD thesis, titled *The influence of structure formation on the evolution of the universe*, was described by an examiner from Oxford as "a remarkable piece of work and one of the most impressive theses I have read".

One of Umeh's two UCT supervisors, Dr Chris Clarkson (the other is Emeritus Professor George Ellis), described the thesis as "excellent … one of his key results concerns substantial calculations which now allow us to estimate distances and brightnesses to distant galaxies to high precision".

Umeh will graduate at the Science faculty ceremony on 6 June 2013 at Jameson Hall, Upper Campus at UCT.

Umeh lives in a world of dark energy, "spatial averaging" and "quantifying cosmological parameters", in a universe filled with mystery, darkness and vast empty spaces. He says in cosmology there is a working assumption known as the Cosmological Principle.

Umeh says: "This principle states that observers on Earth do not occupy a special place in the universe. One could re-state this assumption by saying that the distribution of all forms of matter in the universe is homogeneous (independent of position) and isotropic (independent of direction) on a scale much greater than the scale of our galaxy, the Milky Way."

His PhD thesis considers what he calls "a mild breaking of the Cosmological Principle".

"We considered a situation where spatial averaging over the type of structures we see in the night sky (for example galaxies and clusters of galaxies) could reveal the type of universe we observe on a large scale, thereby eliminating the need for dark energy."

Umeh has a strong background in theoretical physics and string theory, and says he is trying to carve a global niche in quantifying non-linear effects on all cosmological parameters, in readiness for the SKA project.

Picture of PhD graduate Obinna Umeh attached - Courtesy of UCT

ENDS

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