Why matter matters in the universe

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A new physics discovery explores why there is more matter than antimatter in the universe. The latest research findings, which involved significant contributions from physicists at the University of Melbourne, have been recently published in the prestigious journal *Nature*.

The paper reveals that investigation into the process of B-meson decays has given insight into why there is more matter than antimatter in the universe.

“B-mesons are a new frontier of investigation for us and have proved very exciting in the formation of new thought in the field of particle physics.” said Associate Professor Martin Sevior of the University’s School of Physics who led the research.

Sevior says that B-mesons contain heavy quarks that can only be created in very high energy particle accelerators. Their decays provide a powerful means of probing the exotic conditions that occurred in the first fraction of a second after the Big Bang created the Universe.

“Our universe is made up almost completely of matter. While we’re entirely used to this idea, this does not agree with our ideas of how mass and energy interact. According to these theories there should not be enough mass to enable the formation of stars and hence life.”

“In our standard model of particle physics, matter and antimatter are almost identical. Accordingly as they mix in the early universe they annihilate one another leaving very little to form stars and galaxies. The

model does not come close to explaining the difference between matter and antimatter we see in the nature. The imbalance is a trillion times bigger than the model predicts."

Sevior says that this inconsistency between the model and the universe implies there is a new principle of physics that we haven't yet discovered.

"Together with our colleagues in the Belle experiment, based at KEK in Japan, we have produced vast numbers of B mesons with the world's most intense particle collider."

"We then looked at how the B-mesons decay as opposed to how the anti-B-mesons decay. What we find is that there are small differences in these processes. While most of our measurements confirm predictions of the Standard Model of Particle Physics, this new result appears to be in disagreement."

"It is a very exciting discovery because our paper provides a hint as to what the new principle of physics is that led to our Universe being able to support life."

Source: University of Melbourne