Houston Philosophical Society Dinner and Lecture

Cohen House, Rice University

17 January 2019

6:00pm cocktails - 9:15pm close

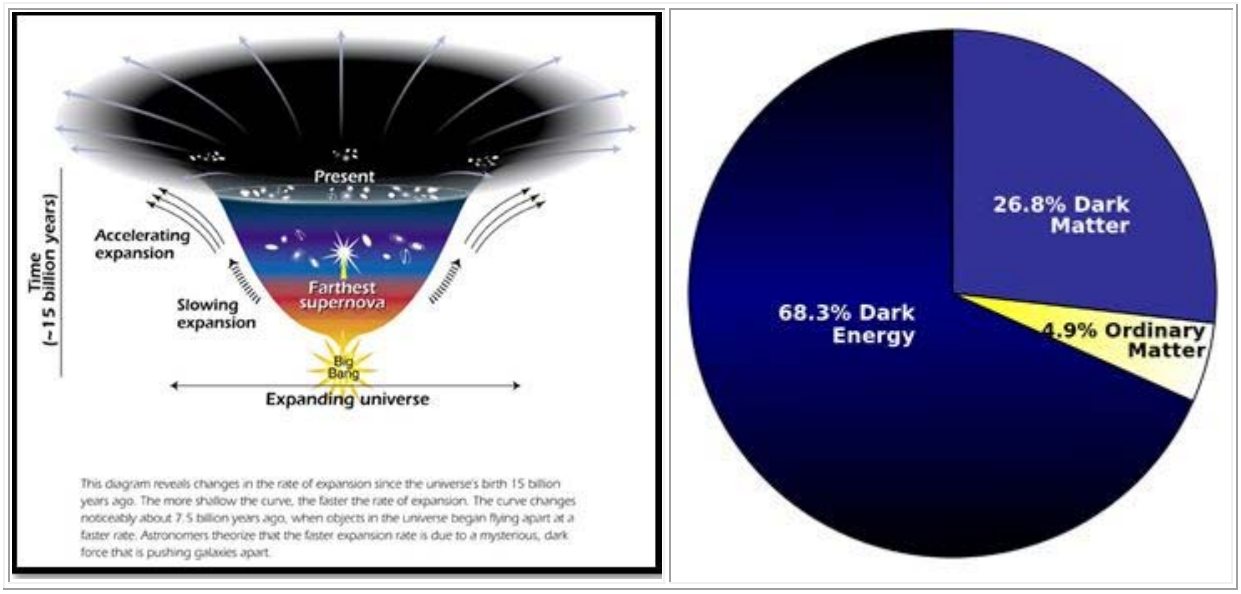
At 8:00 pm President Furlow called the meeting to order and welcomed all. First time guests were introduced.

President Furlow then introduced the speaker, Dr. Robert Webb, Ed Rachel Chair in High Energy Physics, in Texas A&M University's Department of Physics and Astronomy. Please see the attached Abstract for the Speakers' biography and program contents.

What is dark matter? Most physicists, astronomers, and cosmologists theorize that dark matter is an as yet hypothetical form of matter. Most believe that dark matter, or dark matter and dark energy, account for approximately 85% of the matter in the universe, and about a quarter of its total energy density.

Where do we find dark matter? Should we seek it in the history, structure, and movement of galaxies? Or among the tiniest sub-atomic elements in accelerators and laboratories on earth? Or both?

The majority of dark matter is thought to be non-baryonic in nature, possibly being composed of some as-yet undiscovered subatomic particles. Its presence is implied in a variety of astrophysical observations, including gravitational effects that cannot be explained unless more matter is present than can be seen with today's telescopes, instruments, and scans.



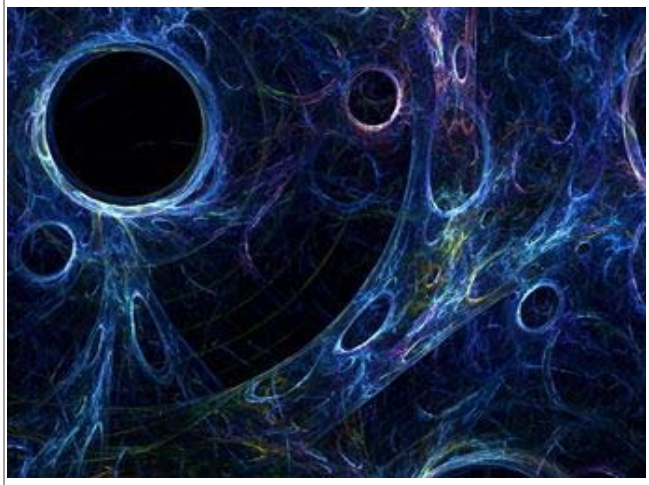
For this reason, most experts think dark matter to be ubiquitous in the universe and to have had a strong influence on its structure and evolution. Dark matter is called dark because it does not appear to interact with observable electromagnetic radiation, such as light, and is thus invisible to the entire electromagnetic spectrum, making it extremely difficult to detect using usual astronomical equipment. Dark matter is also believed to be cold (slow-moving), collision-less (passing through itself and other matter) and massive (gravitationally attractive and clustering).

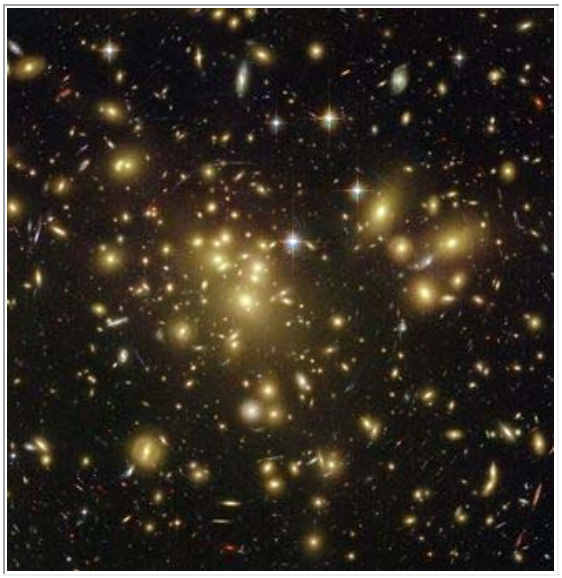
Dr. Robert Webb conducts research in experimental high-energy particle physics. He searches for super-heavy GUT magnetic monopoles in cosmic rays emanating in deep space using the MACRO detector at the Gran Sasso Laboratory. He also studies proton-antiproton interactions at the Fermilab. From 1995-2008, Dr. Webb has been involved with the long baseline neutrino oscillation experiment, MINOS, carried out using Fermilab's Main Injector Accelerator.

Professor Webb received his B.A. degree from the University of

Pennsylvania and his M.A. (1970) and Ph.D. (1972) from Princeton University. He has held positions as adjunct assistant professor at UCLA and research associate and assistant professor at Princeton University. He joined the Texas A&M faculty in 1980. From 1995-2008, Dr. Webb has been involved with the long baseline neutrino oscillation experiment, MINOS, carried out using Fermilab's Main Injector Accelerator. This experiment was designed to answer directly the question about whether or not neutrinos have mass in the range being indicated in recent atmospheric neutrino experiments. MINOS formally presented its first results on neutrino oscillations at Fermi Lab in March 2006 and has since that time produced the most precise measurements of the neutrino.

More recently, Dr. Webb has returned to his study of exotic forms of matter in cosmic rays. With faculty colleague, James White, they have joined the Large Underground Xenon Dark Matter Detector (LUX) being staged at the Sanford Underground Laboratory in Lead, SD. This experiment uses a two-phase liquid Xenon detector to search for the feeble impacts of DM WIMPs as they pass through the detector.





After questions and answers from the members, the meeting was adjourned at 9:15 p.m.