

UCLA Division of Astronomy & Astrophysics

Astronomy Colloquium

Wednesday, April 15 at 3:30 PM

Room 1-434 PAB

Dr. Carlos S. Frenk
Durham University



The rise and fall of LCDM?

The "Lambda cold dark matter" (LCDM) cosmological model (where Lambda stands for Einstein's cosmological constant and CDM for cold dark matter) is one of the great achievements in Physics of the past forty years. Theoretical predictions formulated in the 1980s turned out to agree remarkably well with measurements, performed decades later, of the galaxy distribution and the temperature structure of the cosmic microwave background radiation. Yet, these successes do not inform us directly about the nature of the dark matter or the dark energy which are the two cornerstones of the model. In recent years a number of observations have suggested possible discrepancies with LCDM both on large and small scales. On large scales results from the DESI galaxy survey are inconsistent with Lambda and suggest instead an evolving dark energy. On small scales, the abundance of satellite galaxies in the Milky Way and the discovery of bright galaxies at very early times by the James Webb Space telescope are often interpreted as challenges to the standard model. After a brief historical overview of how the model emerged, I will discuss and assess these discrepancies and the prospects for answering the question posed in the title.

Hosted by Profs. Smadar Naoz, Alice Shapley and Erik Petigura.

Bio: Carlos Frenk is Ogden Professor of Fundamental Physics, founder, in 2002, of Durham University's Institute for Computational Cosmology, of which he was Director until 2020. He is one of the originators of the "Cold dark matter" theory of the formation of cosmic structures, specializing on supercomputer simulations and semi-analytic models of the evolution of the universe. He has published over 600 scientific refereed papers which have been cited over 150,000 times. Frenk was elected Fellow of the Royal Society in 2004 and has received numerous prizes, including the Gold Medal of the Royal Astronomical Society, the Rumford medal of the Royal Society, the Dirac medal of the Institute of Physics, the Max Born medal of the German Physics Society, the Gruber Cosmology prize, the Hoyle medal, the Alexander von Humboldt Fellowship, the Oort Professorship, etc. He was awarded a CBE in the 2017 Queen's birthday honours list. Frenk is currently a member of the Royal Society Council, chair of the Royal Society Public Engagement Committee and of the ERC Advanced Investigator Grants Panel 9. He has received over £65 million in research grants, including two European Research Council (ERC) Advanced Investigator grants. He played a major role in obtaining external funding for two research buildings at Durham, one a landmark building designed by Daniel Libeskind which was opened in March 2017. He features regularly on radio and TV.