George Efstathiou

Doctor of Science

Durham Cathedral, 10 January 2025

Chancellor, ladies and gentlemen,

Astronomy – the study of celestial objects: planets, stars, galaxies – and cosmology – the study of the universe as a whole – are the oldest sciences. The first thinking humans must have marvelled, just as we do today, at the immensity of the night sky, at the perennial cycle of sun and moon, at the terrifying sight of a solar eclipse. These astronomical observations will have evoked questions of a fundamental nature in our ancestors: What are the forces that govern the cosmos? Where do we come from? Why are we here? What is our place in the cosmos?

Durham has a great tradition in astronomy, going back to Thomas Wright in the 1700s. There has been tremendous progress, of course, since those days. Today, we have a "standard model of cosmology", called the Lambda-Cold-Dark-Matter model, which addresses some of the fundamental questions I just listed; it is of the great achievements in Physics of the past 25 years. George Efstathiou is one of a handful of individuals responsible for this remarkable advance. He has made profound and innovative contributions to the standard model in several areas.

Before telling you a little about George's fascinating work, a few words about his equally fascinating life. George is the son of Greek Cypriot immigrants who came to the UK in the 1950s and set up a fish and chips shop in North London. George was born in London and was educated at Tottenham Grammar School. At the age of 16 he attended a career's chat with the headmaster where he stated his ambition to read Physics at Oxford. The headmaster laughed and told him he would be lucky to become a technician. George took him to his word, abandoned his formal studies, and became a lab technician at the school. Between this and helping at the chippy, he managed to study for A-levels and took the exams with such brilliance that he was admitted to read Physics at Oxford. He obtained a first and came to Durham University to study for a PhD in astrophysics, which he obtained in 1979.

Durham astronomy in the 1970s was not what it is today; whereas today we have over 150 astronomers, there were hardly any at the time. Working pretty much on his own, George realized that the evolution of galaxies could be simulated in a computer. He adapted a computer code from plasma physics and carried out some of the first simulations of the formation of cosmic structure, thus pioneering what is today one of the most pervasive and powerful tools in astrophysics - cosmological computer simulations.

After Durham, George became a postdoctoral researcher at Berkeley and, in 1980, moved to Cambridge. We began to work together in 1982 when I was a postdoc in Berkeley, where we joined forces with Marc Davis and Simon White. The now standard model idea that galaxies originated from quantum fluctuations amplified by cold dark matter was truly subversive. But we carried out the first simulations of structure formation in such a universe. The results were breathtaking: our computer models looked a lot like the real universe. Over a period of 5 years, we established the key properties of the cold dark matter cosmogony.

Also, during the 1980s George, working with Dick Bond in Canada, had predicted the imprint that these small primordial fluctuations would have left in the radiation from the Big Bang. That radiation had been discovered in the 1960s as a background of microwaves. George and Dick's predictions (as well as those independently obtained by Nobel Prize winner Jim Peebles) were dramatically confirmed in 1993 by NASA's COBE satellite. George has spent the past 20 years or so working on the European Space Agency's Planck satellite which measured the microwave background radiation so precisely that we now know the values of the cosmological parameters of our world model with an astonishing accuracy of 1%.

The third area in which George has worked, starting in his days at Durham, is the analysis of galaxy surveys. Examining the clustering pattern of galaxies, he found the first evidence for the existence of dark energy, years before supernova data confirmed it and earned three US astronomers the Physics Nobel Prize in 2011.

After Cambridge, in 1988, George was appointed Savilian Professor of Astronomy at the University of Oxford where he was head of astrophysics between 1988 and 1994.

He returned to Cambridge in 1997 as Professor of Astrophysics and a Fellow of King's College. He was director of the Institute of Astronomy between 2004 and 2008 and became the first director of the Kavli Institute for Cosmology in 2008.

George has published over 400 papers which have been cited over 130,000 times, making him one of the most cited astrophysicists ever. He was appointed a Fellow of the Royal Society in 1994 and has been awarded many national and international prizes, including the Gruber cosmology prize (jointly with Simon White, Marc Davis, and myself), and, two years ago, the Gold Medal of the Royal Astronomical Society, its highest honour. However, I am sure that he will treasure his Honorary Doctorate from Durham more than any of these awards.

Chancellor, I present former Durham PhD student, George Efstathiou, a scientist of originality and brilliance, to receive the degree of Doctor of Science Honoris Causa.