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Scuola Internazionale Superiore di Studi Avanzati

PRESS RELEASE

The frontiers of our understanding of the Universe: George Ellis at SISSA to mark the centenary of Dennis Sciama's birth

The South African cosmologist, a former student of Sciama, gave a lecture on the major unsolved questions in cosmology. To mark the centenary of the British scientist's birth, SISSA also unveiled an updated version of the exhibition 'The history of the Universe at a glance. 13.8 billion years in 130 metres', renaming the corridor in which it is displayed after Dennis Sciama.

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Is the Universe finite or infinite? Did it have a beginning? Is it unique? And could it host other forms of intelligent life? These are some of the big questions addressed today at SISSA by George Ellis, one of the leading figures in contemporary cosmology, Professor Emeritus at the University of Cape Town and Fellow of the Royal Society. His Colloquium, entitled 'The Nature of the Universe: What We Know and What We Do Not Know', was at the core of the celebrations marking the centenary of the birth of Dennis Sciama, one of the founding fathers of modern cosmology and director of the Astrophysics group at SISSA from 1983 and 1998.

"Cosmology has revealed the vast scale and age of the Universe as well as its geometry. However, there are a series of effective horizons restricting what we know," Ellis said during his Colloquium. "We don't know if the Universe had a beginning. If it did have a beginning, what happened 'before' is not described by science: physics did not exist then," the South African scientist stated. And even when it comes to the possibility of other universes or extraterrestrial life forms, Ellis is very clear about how difficult it is to prove their existence: "We can't do experiments on other universes or observe them - if they exist. Is there intelligent life elsewhere in our Galaxy or our Universe? Almost certainly, yes in both cases. Can we interact with them? No."

The history of the Universe at a glance. 13.8 billion years in 130 metres

Ellis was also invited to SISSA to inaugurate a fully renovatedpermanent exhibition 'The History of the Universe at a Glance. 13.8 billion years in 130 metres', which has been completely revised and updated in the light of the latest discoveries and is on permanent display in the corridor dedicated to Sciama on the sixth floor of

the School. Through eleven large panels, the installation traces the history of our Universe, from the most recent hypotheses about its origin to the latest discoveries of exoplanets – distant worlds and potential candidates for harbouring life elsewhere in the cosmos. On the floor, a timeline accompanies the stages of the formation of the Universe, each of which is explored in depth on the respective panel. At the end of the chronological journey, a unique artefact from the recent history of observational cosmology is on display: one of the aluminium plates used in the Sloan Digital Sky Survey, a series of astronomical surveys which, between 1999 and 2021, created one of the most detailed 3D maps of the Universe ever produced.

The exhibition's update was supported by SISSA's Interdisciplinary Laboratory under the scientific supervision of Professors Roberto Trotta, Stefano Liberati and Nicoletta Krachmalnicoff. The project was curated and produced by SISSA Medialab, with exhibition design and graphics by Amuse Studio.

"With the reopening of the exhibition, we have created a spectacular, accessible and educational journey, aimed at conveying the beauty of the cosmos and the fascination of studying the Universe, incorporating all the latest discoveries as well as the mysteries yet to be solved," commented Trotta, cosmologist and director of the Interdisciplinary Laboratory at SISSA. "We are delighted to be able to rededicate the corridor housing the exhibition to Dennis Sciama, a leading figure in both astrophysics and science communication."

Susan Sciama, the cosmologist's daughter, also spoke at the opening, recalling the bond between her father and Ellis, one of his first students, who "has flown all the way from South Africa to give a talk in honour of the day. It is a pleasure to be here on this happy occasion, and I hope it will inspire many children to be the scientists of the future - or in other creative ways!"

Dennis Sciama, George Ellis and SISSA

Sciama's legacy is a defining feature of his scientific work. Stefano Liberati, now Professor of Astroparticle Physics and Gravitation at SISSA and a former doctoral student of Sciama's, recalls the British scientist's pivotal role at SISSA. "He gave a decisive contribution to the international recognition of SISSA's Astrophysics group," said Liberati. "Many of the research topics active today – from cosmology to astrophysics to gravitational astroparticle physics – are the natural continuation of a cultural tradition that began with Sciama, both in terms of subject matter and research methodology." It was the British scientist himself who offered Ellis, his first student at Cambridge, the post at SISSA. "I was delighted when Dennis offered

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me the position of Professor in the Astrophysics group at SISSA," recalled the South African scientist, "where I stayed for 7 years, and then have revisited multiple times. Many of the SISSA PhD students have in their turn made major contributions to astrophysics, cosmology and astronomy. It is very fitting that his time at SISSA is being celebrated on the centenary of his birth."

George Ellis was one of a generation of world-class scientists trained by Sciama, alongside figures such as Stephen Hawking, Martin Rees, Brandon Carter and David Deutsch

George Ellis

George Ellis, Fellow of the Royal Society, is Professor Emeritus of Applied Mathematics at the University of Cape Town. He obtained his PhD at the University of Cambridge in 1964, where he worked on general relativity theory and cosmology. He has been based at the University of Cape Town since 1974, but has been visiting Professor at Texas, Chicago, Hamburg, Boston, Edmonton, London, and Oxford, and, for a while, was Professor of Cosmic Physics at the International School of Advanced Studies (SISSA), Trieste. In recent years he has been working on the philosophy of cosmology and the emergence of complexity, the nature of causation, and aspects of neuroscience.

In 1999 he was awarded the Star of South Africa Medal by President Nelson Mandela, and in 2004, the Templeton Prize. His books include 'The Large Scale Structure of Space Time' (1973, with Stephen Hawking), 'The Moral Nature of the Universe: Cosmology, Theology, and Ethics' (1996, with Nancy Murphy), 'Downward Causation and the Neurobiology of Free Will' (2009, Ed, with Nancey Murphy and Tim O'Connor), 'How Can Physics Underlie the Mind: Top-Down Causation in the Human Context' (2017), 'Beyond Evolutionary Psychology' (2018, with Mark Solms), 'Relativistic Cosmology' (2021, with Roy Maartens and Malcolm MacCallum) and 'How we come to be: Almost everything that leads to our existence' (2026).

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