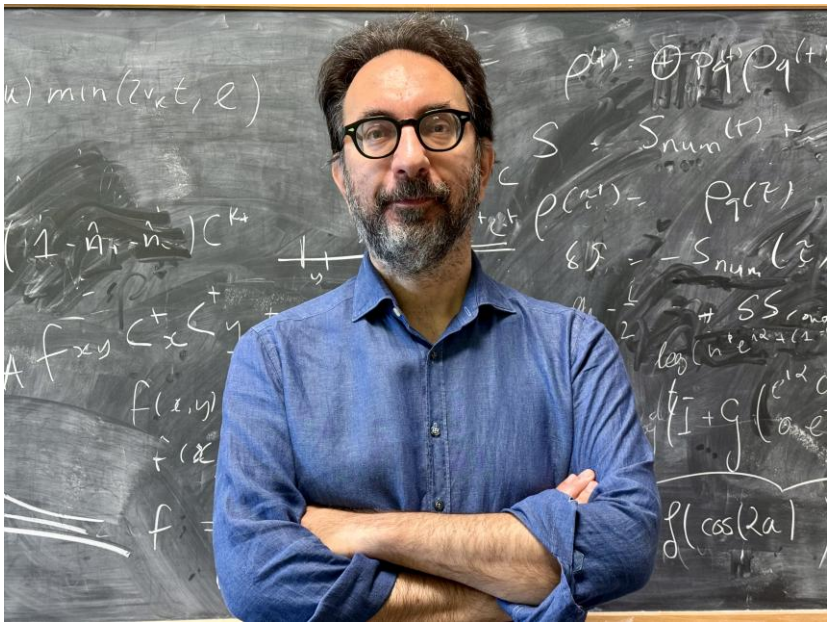
SISSA
Scuola Internazionale Superiore di Studi Avanzati

PRESS RELEASE

Third ERC Grant for SISSA Physicist Pasquale Calabrese: €2.4 Million to Study Quantum Entanglement

The most selective European research funding once again rewards the scientist from the Trieste-based institute. His research will explore fundamental quantum phenomena and their potential implications in various fields, from black holes to future computing.
SISSA ranks first in Italy for the number of ERC grants won per researcher.



Trieste, 17 June 2025

€2.4 million: that's the amount awarded to Professor Pasquale Calabrese of SISSA through a European Research Council (ERC) Advanced Grant to investigate some of the deepest mysteries of matter and quantum physics in his new project, "MOSE – Monitoring Symmetries with Entanglement." The project will explore a highly sophisticated topic in quantum science: the interplay between symmetries and entanglement — with wide-reaching implications from black hole research to future quantum computers and condensed matter physics.

This is Professor Calabrese's third ERC grant in under 15 years, a rare achievement given the high level of competition. The ERC is the most prestigious and selective research funding body in Europe. With this Advanced Grant,

Professor Calabrese has received over €5 million in total from the ERC — an exceptional milestone not only in theoretical physics, but in science more broadly.

SISSA thus confirms itself as a competitive and excellent institution. The Trieste-based school ranks first in Italy for ERC funding, with a total of 33 grants, in relation to the number of scientists. The number of ERCs obtained so far, relative to the size of the faculty, is by far the highest among Italian universities, with approximately one ERC for every three faculty members—a success rate 25 times higher than the national academic average.

Symmetries, Entanglement, the Mpemba Effect and the MOSE Project

Quantum entanglement is a physical phenomenon in which two or more particles that have interacted remain inseparably linked. What happens to one instantly affects the other, regardless of the distance between them.

Symmetries and entanglement are two foundational concepts in modern quantum physics. They have revolutionized our understanding of quantum many-body systems. Their interaction is now a central theme in cutting-edge research, with implications across quantum computing, condensed matter physics, and high-energy physics.

The MOSE project aims to uncover the connections between symmetry and entanglement in quantum and statistical mechanical systems. Using advanced theoretical approaches, it will investigate entanglement in black hole-related phenomena. The project will also study the so-called "Mpemba effect" — a counterintuitive situation where a warm system can cool faster than a cold one — looking for connections between classical and quantum dynamics through symmetry principles.

While Professor Calabrese’s group will focus on the theoretical aspects, an experimental part will be carried out by other research groups to verify whether the predictions can be observed in the laboratory. This interdisciplinary approach will help to better understand fundamental quantum phenomena and their potential applications in future quantum devices, such as quantum computers.

About the Project Coordinator Professor Pasquale Calabrese

Born in 1976, Pasquale Calabrese earned his degree in physics from the University of Pisa and his PhD from the Scuola Normale Superiore. He held positions at Oxford and Amsterdam before returning to Pisa and later joining SISSA in 2014, bringing with him his first ERC (project EDEQS). In 2018, he

SISSA
Scuola Internazionale Superiore di Studi Avanzati

received a second ERC Consolidator Grant for the NEMO project (New states of Entangled Matter Out of equilibrium).

Commenting on this latest success, Professor Calabrese said:“I am very happy and proud of this result, which comes at the end of yet another extremely selective process. This third ERC grant is a strong recognition of my work and more broadly, of the research carried out at SISSA. It will allow me to continue doing top-level research and help make our School even more international and competitive.”

The ERC Advanced Grant

This year’s ERC Advanced Grant scheme will provide €721 million to 281 leading researchers across Europe. One of the most prestigious and competitive funding calls in the EU, it allows senior researchers to pursue high-risk, high-reward projects that may lead to major scientific breakthroughs. These grants are part of the EU’s Horizon Europe programme.

Statement from SISSA Director Andrea Romanino

SISSA Director Andrea Romanino comments: “The fact that a university institution with fewer than 90 faculty members manages to obtain such a high number of European grants is a sign of the quality and international profile of its academic staff, among whom Professor Calabrese stands out as a particularly prominent figure. This result goes hand in hand with the percentage of so-called 'top scientists'—also the highest in Italy—and with the research quality assessments conducted by ANVUR”.

IMAGE
Crediti: SISSA

SISSA
Scuola Internazionale
Superiore di Studi Avanzati
Via Bonomea 265, Trieste
W www.sissa.it

Facebook, Twitter
@SISSAschool

CONTATTI
Nico Pitrelli
M pitrelli@sissa.it
T +39 33901337950

Donato Ramani
M ramani@sissa.it
T +39 342 80 222 37