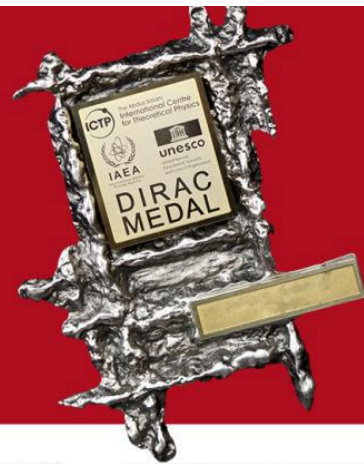




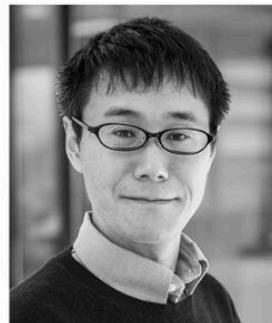
ICTP Announces 2024 Dirac Medallists

Four physicists recognized for their contributions to quantum entropy

DIRAC MEDAL 2024



Abdus Salam with P.A.M. Dirac
Cambridge University, 1965



ICTP has awarded its 2024 Dirac Medal to four physicists who have made pioneering contributions to the understanding of quantum entropy in gravity and quantum field theory.

The winners are:



Marina Huerta, CONICET and Bariloche Atomic Centre, Argentina

Shinsei Ryu, Princeton University, United States

Tadashi Takayanagi, Kyoto University, Japan

The award cites “their insights on quantum entropy in quantum gravity and quantum field theories”.

One of the most surprising features of quantum physics is the ability of particles to continue being correlated even when far apart. This property, called "entanglement," is the focus of the work of the four scientists honoured by ICTP this year.

“The 2024 Dirac Medallists have made pioneering contributions to our understanding of different aspects of quantum entanglement,” says ICTP Director Atish Dabholkar. "The work of Ryu and Takayanagi has revealed a fascinating and deep connection between quantum mechanics and information theory on one hand, and the geometry of space-time and gravity on the other," he explains, adding, "The work of Casini and Huerta uses the properties of quantum entanglement entropy to derive important general results about the structure of quantum field theories." The 2024 Dirac Medal therefore rewards research that brings together two aspects of physics - quantum mechanics and gravity - whose unified description has been the 'Holy Grail' of theoretical physicists for more than half a century.

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ICTP Director Atish Dabholkar on quantum entanglement and the work of the ...



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Casini and Huerta studied aspects of quantum entropy for quantum field theories, focusing on the entropy of subregions, and then applied these results to the study of renormalization group flows. In 1+1 dimensions they showed that the entropy of an interval decreases monotonically under the renormalization group flow, providing an alternative proof of the well-known c-theorem. They extended this reasoning to 2+1 dimensional field theories, where they showed that the entropy of a circular subregion in 2+1 dimensional subregion decreases under renormalization group flow. Casini and collaborators further extended these ideas to 3+1 dimensions.

Casini used properties of quantum relative entropy to provide a precise formulation and an elegant proof of a version of the Bekenstein bound.

About the 2024 Dirac Medallists

Horacio Casini is a researcher with the National Scientific and Technical Council (CONICET), and the Bariloche Atomic Centre, in Argentina. He is a recipient of the 2015 New Horizons in Physics Prize.

Marina Huerta is a researcher with CONICET and the Bariloche Atomic Centre, in Argentina. She is a recipient of the 2015 New Horizons in Physics Prize.

Shinsei Ryu is a physicist with his research, including the 2015 New Horizons in Physics Prize.

Tadashi Takayama received the Kimura Prize in 2015 and the Physics Prize in 2016.

About the ICTP Dirac Medal

ICTP's Dirac Medal is awarded to theoretical physicists for their contributions to the field in the 20th century and a status of international community.

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