

P.A.M. DIRAC (1902-1984)

Paul Adrien Maurice Dirac was born in Bristol, England, on 8 August 1902. He studied engineering in his hometown, and obtained his degree in physics and mathematics at Cambridge University, where in 1932 he became professor of mathematics in the Lucasian Chair, which had been held by Sir Isaac Newton two centuries earlier. After his retirement, Professor Dirac went to live in Tallahassee, Florida, where he taught at Florida State University from 1971 until his death on 20 October 1984.

A member of the Royal Society since 1930, he won the Royal Medal in 1939 and the Copley Medal in 1952. Professor Dirac shared the Nobel Prize for Physics with Erwin Schrödinger in 1933. He invented the well-known relativistic wave equation predicting the existence of spin and of the positron when he was only 23 years old. His further work includes his formulations of quantum field theory, statistics of fields and particles, gravitational waves and the prediction of magnetic monopoles.

Dirac first came to Trieste in June 1968 on the occasion of the International Symposium on Contemporary Physics, at which he delivered a lecture on the methods of theoretical physics. After this symposium, Dirac was a guest of honour at the Centre for a month or so nearly every year. In 1972, at a symposium on The Physicists' Conception of Nature organized in honour of Dirac on the occasion of his 70th birthday, he gave a lecture on Fundamental Constants and their Development in Time. Dirac also attended the Marcel Grossman Meeting held at the Centre on the centennial of the birth of Albert Einstein in 1979.

Abdus Salam, who proposed the institution of the Dirac Medal, was Dirac's student at Cambridge and it was after having listened to Dirac's lectures that he decided to devote his life to research rather than becoming a civil servant in his country. He remained in touch with his master and became his friend.



Abdus Salam with P.A.M. Dirac
Cambridge University, 1968

DIRAC MEDAL



The Abdus Salam
International Centre
for Theoretical Physics



2015 DIRAC MEDAL CEREMONY

8 August 2016

ICTP Budinich Lecture Hall

14:30

Programme



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THE 2015 DIRAC MEDAL AND PRIZE

The 2015 Dirac Medal was awarded to three physicists for their interdisciplinary contributions which introduced concepts of conformal field theory and non-abelian quasiparticle statistics in condensed matter systems and applications of these ideas to quantum computation.

- **Alexei Kitaev** (California Institute of Technology)
- **Gregory W. Moore** (Rutgers University)
- **Nicholas Read** (Yale University)

CEREMONY PROGRAMME

14:30 Remarks by Fernando Quevedo, Director, ICTP

14:45 Introduction to Dirac Medal lectures, Akira Furusaki, RIKEN, Japan

15:00 **Alexei Kitaev: A toy model of a quantum black hole**

According to Hawking's theory, the black hole horizon may be regarded as a heat bath with a certain temperature. This picture, which misses subtle quantum gravity effects, is similar to the Gaussian heat bath approximation in conventional many-body physics. In both cases, a significant deviation from Gaussianity is found for out-of-time-order (OTO) correlators of quantum observables. However, such correlators for black holes have some peculiar properties that are not shared by typical condensed matter systems. Kitaev will describe a quantum Hamiltonian that reproduces the most important features of the black hole correlators.

15:45 **Gregory Moore: Some comments on families of quantum systems**

Moore will reminisce briefly about the talk where he presented his work with Nick Read. Then he will try to explain that there is not a single Berry connection for a band structure insulator. Rather, there is a family of Berry connections and this has physical consequences for electric polarization and for the topological part of the magnetoelectric polarizability tensor. Time permitting, he will discuss how one can formulate a notion of families of quantum mechanical systems parametrized by a noncommutative manifold.

16:30 **Nicholas Read: No-go theorems for free-fermion tensor network states**

Tensor network states, constructed as products of tensors that depend on physical and nearby auxiliary degrees of freedom, summed over the auxiliary variables, can be constructed for many topological phases of matter, and there are short-range parent Hamiltonians for which the TNS is the exact ground state. However, for free-fermion topological phases that possess protected gapless edge modes, such constructions have turned out to be impossible unless the parent Hamiltonian is gapless. In this talk the proof of this result, and its extension to all ten symmetry classes in all dimensions of space, will be explained. The proofs involve algebraic K-theory.

ABOUT THE DIRAC MEDAL

The Abdus Salam International Centre for Theoretical Physics awarded its first Dirac Medal in 1985. The Medal is given in honour of P.A.M. Dirac, one of the greatest physicists of the 20th century and a staunch friend of the Centre. It is awarded annually on Dirac's birthday, 8 August, to an individual or individuals who have made significant contributions to physics.