

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.

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www.ictp.it

DIRAC MEDAL



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



The Abdus Salam
International Centre
for Theoretical Physics



2017 DIRAC MEDAL CEREMONY

14 March 2018
ICTP Budinich Lecture Hall
14:30

Programme



The Abdus Salam
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THE 2017 DIRAC MEDAL AND PRIZE

The 2017 Dirac Medal is awarded to three physicists for their pioneering work in applying the fundamental concepts of quantum mechanics to solving basic problems in computation and communication and therefore bringing together the fields of quantum mechanics, computer science and information.

Charles H. Bennett (IBM Watson Research Centre)

David Deutsch (University of Oxford)

Peter W. Shor (MIT)

CEREMONY PROGRAMME

14:30 Welcome by Fernando Quevedo, Director, ICTP

Introductory talks by:

Peter Zoller, University of Innsbruck (2006 Dirac Medallist):

Quantum Information Processing with Quantum Optical Systems

In this talk I will summarize history and progress in implementing quantum computing, quantum simulation and quantum communication with quantum optical systems – a development motivated and initiated in particular also by this year's Dirac medalists. I will focus on quantum optical systems of atoms and ions manipulated by laser light, providing prime examples of quantum systems, which can be controlled on the level of single quanta. This includes a discussion of trapped ions as a universal quantum processor, and digital and analog quantum simulation of strongly correlated quantum matter with atoms in optical lattices. I conclude with an outlook on a 'quantum internet' and building a 'quantum annealer'.

Artur Ekert, University of Oxford: Privacy for the Paranoid Ones - The Ultimate Limits of Secrecy

Among those who make a living from the science of secrecy, worry and paranoia are just signs of professionalism. Can we protect our secrets against those who wield superior technological powers? Can we trust those who provide us with tools for protection? Can we even trust ourselves, our own freedom of choice? Recent developments in quantum cryptography show that some of these questions can be addressed and discussed in precise and operational terms, suggesting that privacy is indeed possible under surprisingly weak assumptions.

16:00 - 16:15 Coffee break

16:15 - 17:45 Dirac Medal Ceremony & Lectures

Peter Shor: The Discovery of the Factoring Algorithm

I will explain the background and motivation for my discovery of the factoring algorithm, and describe the reaction that followed this discovery

Charles Bennett: Forging the Culture of Quantum Information Science

Physicists, mathematicians and engineers, guided by what has worked well in their respective disciplines, have developed different scientific tastes, different notions of what constitutes an interesting, well-posed problem or an adequate solution. While this has led to some frustrating misunderstandings, it has invigorated the theory of communication and computation, enabling it to outgrow its brash beginnings and develop a coherent scientific taste of its own, adopting ideas from thermodynamics and quantum mechanics that physicists had mistakenly thought belonged solely to their field, to better formalize the core concepts of communication and computation. The history of quantum information shows how wrong ideas can sometimes promote scientific progress more efficiently than correct ones, while the history of thermodynamics and information shows how correct ideas can be forgotten and then need to be rediscovered.

David Deutsch: The Mathematicians' Misconception

If you think that what does or doesn't constitute a *mathematical proof* is a matter of pure logic, you have the Mathematicians' Misconception.

POST-CEREMONY PUBLIC EVENT

Quantum Technologies: The Dawn of a New Industrial Revolution

18:30, Savoia Excelsior Palace, Trieste

A moderated roundtable discussion with:

- Hartmut Neven, Google's Director of Engineering
- Alessandro Curioni, IBM Fellow, Vice President of IBM Europe and Director of the IBM Research Lab in Zurich
- Tommaso Calarco, Director, Institute for Complex Quantum Systems, University of Ulm and member of the expert group for the European Commission's Quantum Technology Flagship