



Juan Ignacio Cirac

2006 PRINCE OF ASTURIAS AWARD
Max Planck Institute of Quantum Optics
Garching, Germany

Quantum Physics: A new view of Nature and much more

Quantum Mechanics is a theory for the microscopic world which was developed during the last century. Most aspects of such theory are exploited in most of the electrical devices we use in our everyday life: computers, television sets, lasers, etc operate thanks to the laws of Quantum Mechanics. However, there exist other aspects of that theory, more mysterious and even exotic, that could give rise to completely new applications in the fields of communication and computation. Those are related to the existence of superposition states; that is, situations where an object seem to be in two places at the same time, or to have two opposite physical properties. Phenomena related to superposition states have been recently tested giving rise to a series of results which defy our basic understanding. In this talk I will explain what we know about those phenomena, some of their philosophical implications, and the consequences they may have in the future of computation and communication.

BIO

Juan Ignacio Cirac was born in Manresa (Spain). In 1988, he graduated in Theoretical Physics from the Complutense University of Madrid, and subsequently received his PhD in 1991. Prof. Cirac is a member of the Max Planck Society since 2001, when he was appointed Director of the Max Planck Institute of Quantum Optics in Garching (Germany). As an expert in quantum computation and its application in the field of information, the focus of his research work is the quantum theory of information. His theories propose that quantum computers will bring a new revolution to the field of information, as it will lead to more efficient communication and far greater security in both data processing and bank transfers. He is a corresponding member of both the Spanish and the Austrian academies of sciences, as well as the American Physical Society. Prof. Cirac has won many awards including the Felix Kuschenitz Prize at the Austrian Academy of Sciences (2001), the Quantum Electronics from the European Science Foundation (2005), the Prince of Asturias Prize for Scientific and Technical Research (2006), the Frontiers of Knowledge and Culture Award for basic science given by the BBVA Foundation (2008) and, most recently, the 2010 Benjamin Franklin Medal in Physics.