
*** PROGRAMA DE VERÃO 2012 ***

SISTEMAS DINÂMICOS

Seeking rigour in the interpretation of quantum physics

Charles Tresser (IBM - EUA)

This course is about the interpretation of Quantum Physics (QP), by which is meant the physics at small scale when relativity can be mostly neglected, by which we mean essentially the Realm of application of Quantum Mechanics (QM), that is a well formulated theory (in a couple of detailed forms) that is the essential tool of theoretical QP.

By the distinction between QM and QP, we mean in particular that sticking to the canons of MQ is not considered as a priority, although all efforts are made to stay aligned with QM whenever possible. Since physics is known for instance to require relativistic corrections in some regimes, it is to be expected that QM be at most tangent to QP, and since QM was formulated on the basis of some experimental data, nothing can guarantee a priori that enlarging the set of experiments will not force some departure, hopefully quite small either from QM or from the way it is used in theoretical QP.

At least one of the formulations of QM, due to von Neumann, stands in all mathematical rigor since 1932, about five years after the papers that stand as the original expression of QM (Heisenberg, Schrödinger, Dirac, Born, Jordan between 1925 and 1927) got written after the foundational works of Planck, Einstein, Bohr, Sommerfeld, de Broglie etc., and with additions by people such as Ehrenfest, Pauli, Wigner etc., altogether occupying the 30 first years of the twentieth century. On the other hand, Dirac's formulation as it appears in his book published in 1930 certainly has at least all the rigor physicists usually expect from a completely coherent theory.

Despite this encouraging facts, the interpretation of quantum mechanics has turned into several competing interpretations, some of which for the least incomplete, some other in direct conflict with what some physicists consider as basic laws of Nature. We take the viewpoint that the formulation of the interpretations so far have lacked the level of rigor of QM itself (as will be illustrated by important examples during the mini-course), in some cases because a priori philosophy stands were taken. There are of course noticeable local counter-examples such as the discussion of the EPR paper by A. Fine.

Data: 24/01, 26/01, 31/01 e 02/02, às 16:00
Local: Auditório Antônio Gilioli (247/262 -- A)