**Ciclo de Charlas sobre Fundamentos de la Física y de la Computación**

**Organizado por el Grupo de Filosofía de la Ciencia dirigido por la Dra. Olimpia Lombardi**

**FCEN. Pabellón II, Planta Baja. Aula de seminario. 18 y 19 de Mayo de 2015**

***Lunes 18 de Mayo***

***15 hs.***

**Adan Cabello, Universidad de Sevilla**

“*Quantum contextuality: Theory, experiments, applications and implications*”.

In quantum theory, marginal probabilities are "non-contextual", that is, independent of the set of compatible observables they are extracted from. However, quantum probabilities cannot be explained assuming that measurements reveal pre-existent non-contextual information. This is what we call "contextuality". It can be quantified by the violation of experimentally testable inequalities, similar to Bell inequalities, involving correlations between the results of compatible measurements. Quantum theory violates these inequalities only up to some specific limits which, quite surprisingly, are connected to graph theory. We will discuss how this connection may explain these limits and shed some light on what does quantum theory really mean.

***16:30 hs.***

**Robert Spekkens, Perimeter Institute for Theoretical Physics**

“*The invasion of physics by information theory*”

Many revolutions in physics have been preceded by the discovery of a novel perspective on an existing physical theory. The discovery of least-action principles, symmetry principles, and thermodynamic principles are good historical examples. Information-theoretic principles may well play a similar role in physics today. To make the case for this idea, I will discuss some of the highlights of two resource theories: the resource theory of asymmetry, which characterizes the relations among quantum states that break a symmetry; and the resource theory of athermality, which characterizes the relations among quantum states that deviate from thermal equilibrium. In particular, I will discuss how Noether's theorem does not capture all of the consequences of symmetries of the dynamics, and how the second law of thermodynamics does not capture all of the constraints on thermodynamic transitions. Finally, I will show that both asymmetry and athermality are informational resources, and that rehabilitated versions of Noether's theorem and the second law can both be understood as constraints on information processing. Considerations such as these---as well as evidence from other fronts of the invasion---make a compelling case for the revolutionary cause of reconceiving physics from an information-theoretic perspective.

***Martes 19 de Mayo***

***16 hs.***

**Armond Duwell, University of Montana**

“*Desiderata for an analysis of computation*”

An analysis of computation tells us what systems are computational systems and what systems are not. Despite the ubiquity of computers, there is no widely agreed upon analysis. In this talk, I'll discuss the problem of providing an analysis of computation, discuss the desiderata for an analysis of computation, and discuss some candidate analyses and their shortcomings.