

# IMPRS EPP

**16th Block Course  
of the  
International Max Planck Research School  
on Elementary Particle Physics**

April 28th – 29th and May 4th – 6th, 2011

Max-Planck-Institut für Physik, Freimann

10:00 AM – 11:55 AM, Main Auditorium

**Dr. Javier Redondo**

Max-Planck-Institute for Physics, Munich

## **Axions and the Strong CP Problem**

The experimental non observation of an electric dipole moment for the neutron constitutes the most stringent evidence of the conservation of parity and time reversal symmetries in the strong interactions. However, from a fundamental level the vacuum structure of quantum chromodynamics predicts generically large violation of P and T through the so called theta term. In the early 80's R. Peccei and H. Quinn proposed a solution to this so called "strong CP problem" that automatically renders the theta term harmless and soon after S. Weinberg and F. Wilczek realised that the Peccei-Quinn model predicts the existence of a new very light and very feebly interacting pseudoscalar particle, the axion. Because of its unusual lightness and weak interactions, the axion phenomenology is very different from that of other hypothetical particles populating extensions of the standard model. The most relevant contexts in which the axion can nowadays be unravelled are indeed stellar evolution and cosmology. Most importantly, the axion can constitute the mysterious dark matter of the universe. In this course I shall describe in detail the strong CP problem and axion models, their impact in stellar evolution and cosmology. I will also review the most relevant axion searches and discuss about the perspectives to discover the axion in the next generation of axion experiments.

No registration is needed.

Dr. Frank Daniel Steffen  
[imprs@mppmu.mpg.de](mailto:imprs@mppmu.mpg.de)  
<http://www.imprs-epp.de>