

Ruder Bošković Institute Division of Theoretical Physics

TWINNING LECTURES

PARTICLE PHYSICS FROM ALMOST-COMMUTATIVE SPACETIMES

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LECTURE 1: ALMOST-COMMUTATIVE SPACETIMES

Tuesday, May 10, 10 a.m. - 12 a.m.

Lecture hall, Wing 1

LECTURE 2: THE LAGRANGIANS

Wednesday, May 11, 2 p.m. - 4 p.m.

Seminar room, Wing 1

LECTURE 3: THE (NONCOMMUTATIVE) STANDARD MODEL AND ITS PHENOMENOLOGY

Thursday, June 30, 2 p.m. - 4 p.m.

Lecture hall, Wing 1

ABSTRACT:

The goal of this series of lectures is to explain in detail how one can use Connes' framework of noncommutative geometry to obtain models in particle physics (as classical gauge theories), coupled with gravity. For this purpose it suffices to consider the almost-commutative case, which is constructed as a (commutative) spacetime with a noncommutative (but finite) 'internal space'. This internal space will describe the gauge content of the theory, while the underlying curved spacetime describes the gravitational part.

In the first lecture, I will develop the abstract formalism of almost-commutative spacetimes, and describe their interpretation as gauge theories on the underlying spacetime. In the second lecture, I will explain how one can derive the Lagrangian of the theory from an almost-commutative manifold. In the last lecture, we will have a detailed look at the noncommutative description of the full Standard Model, and we will consider the phenomenological consequences of this approach to the Standard Model.



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