



CEA-Direction des Sciences de la Matière

Institut de Physique Théorique

Unité de recherche associée au CNRS



Cours de Physique Théorique de l'IPhT, année 2012-2013

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String Theory compactifications

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Les vendredis 22/3/2013, 29/3, 5/4, 12/4, 19/4, 26/4 à 10h00.

String theory is consistently defined in ten dimensions, six of which should be curled up in some small “internal” compact manifold. The procedure of linking this manifold to four-dimensional physics is called string compactification, and in these lectures we will review it quite extensively. We will start with a very brief introduction to string theory, in particular we will work out its massless spectrum and show how the condition on the number of dimensions arises. We will then dwell on the different possible internal manifolds, starting from the simplest to the most relevant phenomenologically. We will show that these are most elegantly described by an extension of ordinary Riemannian geometry termed generalized geometry, first introduced by Hitchin. We shall finish by discussing (partially) open problems in string phenomenology, such as the embedding of the Standard Model and obtaining de Sitter solutions.

1. Introduction to low energy limit of string theory

Bosonic string. Superstring. D-branes and orientifold planes.

2. Compactifications without fluxes

Toroidal compactifications. Dualities. Calabi-Yau compactifications. Effective 4D theories.

3. Compactifications with fluxes

Introduction to fluxes. G-structures.

4. Generalized geometry

Generalized complex geometry. Application to string compactifications.

5. Compactifications in generalized geometries

Effective 4D theories. Supersymmetric vacua. Dualities and non-geometric fluxes.

U-duality and exceptional generalized geometry.

6. Open problems in phenomenology

Embedding the Standard Model. Moduli stabilization and stringy corrections to 4D theory.

De Sitter vacua.

Lieu : IPhT, CEA Saclay, Orme des Merisiers, Bât. 774, p.1A Salle C. Itzykson.

Accès : Par lignes de bus publics (269.02 et 91.06).

Renseignements : <http://ipht.cea.fr> ou ipht-lectures@cea.fr

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