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String Theory Compactifications

 Springer

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Abstract

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.