Universität Bielefeld Fakultät für Physik

Seminar

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Abundant sets of internal spaces for string theory

The ten-dimensional spacetime of string theory is usually interpreted as a cartesian product of a four-dimensional manifold corresponding to the universe we observe and a six-dimensional compact space which is taken to be a Calabi-Yau (CY) threefold (a space of three complex, i.e. six real dimensions). A different construction known as F-theory combines the data of the internal space and of some background fields into those of a CY fourfold. The most fertile construction method for CY manifolds comes from a branch of algebraic geometry known as toric geometry, where families of CY n-folds are associated to (n+1)-dimensional polytopes that have a certain property called reflexivity. I will explain the concepts introduced above. Then I will outline how we managed to classify all 476,800,776 reflexive 4-polytopes almost 20 years ago, which corresponds to the world's largest list of CY threefolds. Finally I will report on recent work on the classification of a particular class of reflexive 5-polytopes (there are 322,383,760,930), which resulted in the largest existing database for CY fourfolds.

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