The Geometry of Hidden Symmetries in Supergravity and Holography

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Abstract: Supersymmetric extensions of Einstein geometric theory of general relativity have the remarkable feature that they can give rise to unexpected global symmetries, known as hidden symmetries. In recent years, there has been progress in phrasing them in a geometric manner through so-called generalised or exceptional geometry. In the first part, I will review these structures and how they give rise to the symmetries of supergravity. I will sketch how they can be used to formulate and study deformations of supergravity in a systematic way. In the second part, I will apply these ideas to a particularly interesting case, both mathematically and physically. This is the case of two-dimensional dilaton-gravity, where work since the 1970s on solution generating techniques and integrable system has been active and is related to an underlying affine Kac-Moody symmetry. I will review recent work on constructing the associated exceptional field theory and use it to obtain new dilaton-gravity models that allow for AdS-type solutions that are conjectured to be holographically dual to matrix models, such as the one associated to D0-branes.

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