Master 2: *International Centre for Fundamental Physics*

INTERNSHIP PROPOSAL

Laboratory name: IPhT - CEA/Saclay
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Internship location: Saclay (Gif-sur-Yvette)

Thesis possibility after internship: YES
Funding already obtained for a PhD: NO

On fluxes, gaugings and obstructions (Swampland constraints on gauged supergravities)

Summary:

The realisation that turning on fluxes in string compactifications leads to gaugings in effective supergravity theories, lead to both significantly better understanding of (supersymmetric) string backgrounds, and to construction and classification of general gauged supergravities.

This recent progress has however lead to new problems and puzzles.

Only a small fraction of the gauged supergravity backgrounds has known string-theoretic realisations. Many are believed not to be realisable in terms of a string theory on any compact geometry with any choice of fluxes. Some have been argued to be related to consistent string compactifications via dualities. Yet this relations is somewhat tenuous - the dualities in question are often obstructed, and hence one should worry about the quantum consistency of these theories.

The swampland program that tries to find general features of consistent theories of quantum gravity based on conjectural but physically-motivated principles is likely to provide the right framework for investigating which ostensibly consistent low energy theories of supergravity will have quantum inconsistencies. For example, the recent swampland-inspired analysis has ruled out infinite families of six-dimensional (ungauged) supergravities with minimal amount of supersymmetry. It has also revealed some surprises - in some models that are known to be consistent, previously hidden constraints have been found.

Studies of four-dimensional gauged supergravities from the point of view of the general principles of quantum consistency are still lacking, and it is proposed to undertake such a study. The expectation is that this study of consistency of qauged supergratvities can lead to two-fold benefits - in addition to ruling out some (presumably infinity of) models without known good string-theoretic realisation, it should facilitate the study of new string-theoretic mechanisms which lead to realisation to the consistent models.

Please, indicate which speciality(ies) seem(s) to be more adapted to the subject:

Condensed Matter Physics: NO Soft Matter and Biological Physics: NO
Quantum Physics: NO Theoretical Physics: YES