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JOHANNES GUTENBERG  
UNIVERSITÄT MAINZ



# RIND seminar on Mathematical Physics and String Theory

May 8, 2023 at 4 p.m. c.t.  
None

Joint seminar series on Mathematical Physics and String Theory

Pyry Kuusela  
JGU Mainz

## **Supersymmetric Flux Vacua and Calabi-Yau Modularity**

Supersymmetric flux vacua in Calabi-Yau compactifications are closely related to intricate number theoretic properties of the compactification manifolds. Such relations are of interest to physicists and number theorists alike: On one hand these can be used to find new, interesting flux vacuum solutions and relate physical quantities to well-studied number theoretic functions. On the other hand, physical intuition allows one to give examples of interesting number theoretic relations and obtain evidence for various conjectures.

To study these relations, we present a novel method, based on symmetries of the compactification manifold, for constructing many large families of number theoretically interesting supersymmetric flux vacua. We show that the zeta functions of the compactification manifolds factorise, as expected by the celebrated modularity conjectures. The coefficients appearing in these factorisations can be associated to elliptic curves which appear in various contexts: For instance, we argue that the value of the axiodilaton field associated to the flux vacua can be identified with the modulus of these elliptic curves. We also obtain extensive evidence for the flux vacuum modularity conjecture proposed recently by Kachru, Nally, and Yang.

This talk is based on arXiv:2302.03047 with Candelas, de la Ossa, and McGovern.  
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