

## MATH-IMS Joint Colloquium Series The Chinese University of Hong Kong

*This MATH-IMS Joint Colloquium Series in pure mathematics is organized by the Department of Mathematics and the Institute of Mathematical Sciences (IMS) at the Chinese University of Hong Kong. The series focus on all areas of pure mathematics together with theoretical developments and applications.*

**Date:** April 21, 2021 (Wednesday)

**Time:** 10am – 11am (Hong Kong Time)

**Zoom Link:** <https://cuhk.zoom.us/j/98846779826>

### Elements of $\infty$ -Category Theory

*Speaker: Professor Emily Riehl  
Johns Hopkins University*

**Abstract:** Confusingly for the uninitiated, experts in weak infinite-dimensional category theory make use of different definitions of an  $\infty$ -category, and theorems in the  $\infty$ -categorical literature are often proven "analytically", in reference to the combinatorial specifications of a particular model. In this talk, we present a new point of view on the foundations of  $\infty$ -category theory, which allows us to develop the basic theory of  $\infty$ -categories --- adjunctions, limits and colimits, co/cartesian fibrations, and pointwise Kan extensions --- "synthetically" starting from axioms that describe an  $\infty$ -cosmos, the infinite-dimensional category in which  $\infty$ -categories live as objects. We demonstrate that the theorems proven in this manner are "model-independent", i.e., invariant under change of model. Moreover, there is a formal language with the feature that any statement about  $\infty$ -categories that is expressible in that language is also invariant under change of model, regardless of whether it is proven through synthetic or analytic techniques. This is joint work with Dominic Verity.

**Bio:** Prof. Riehl obtained her Ph.D. from University of Chicago in 2011 under the direction of Prof. Peter May. She was a NSF postdoc fellow and Benjamin Peirce instructor at Harvard University before moving to John Hopkins University, where she is now an associate professor. She is a recipient of the NSF Career Award.