

# Topological graphs and principal bundles

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007 Kemeny Hall, 4:00 pm  
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## Abstract

Operator algebraists are so gregarious that we'll interact with any field. One of the most fruitful cross-fertilizations for us is with combinatorics, specifically (directed) graphs. Graph algebras are  $C^*$ -algebras associated to graphs (what else?), and are intensively studied because they comprise a broad class of  $C^*$ -algebras, whose properties can be seen from the structure of the graphs. There is a satisfying theory of coverings of graphs, completely parallel with the topological theory of covering spaces. In particular, if a group  $G$  acts freely on a graph  $E$ , then the quotient is also a graph, and the Gross-Tucker theorem shows how to reconstruct  $E$  from  $E/G$ . This has implications for the  $C^*$ -algebras: the  $C^*$ -algebra of  $E/G$  is Morita equivalent (a very good thing) to the crossed product of  $C^*(E)$  by the action of  $G$ . After an elementary description of all this, I'll introduce a topological version, where the coverings are replaced by principal  $G$ -bundles. This is joint work with Valentin Deaconu and Alex Kumjian.