PURDUE UNIVERSITY

Joint PQSEI/Math Colloquium

Julian ("Jay") Hook is an Associate Professor of music theory at the Indiana University Jacobs School of Music, where he has taught since 2003. His research involves transformational theory and other mathematical approaches to the study of musical structure.

Hook's article "Uniform Triadic Transformations" won the Society for Music Theory's Emerging Scholar Award in 2005. He has presented papers at conferences of the Society for Music Theory, the American Mathematical Society, the Society for Mathematics and Computation in Music, and other organizations, and is currently writing a book titled *Exploring Musical Spaces*. He served for six years as reviews editor of the *Journal of Mathematics and Music*, and for two years as president of Music Theory Midwest. In 2010–11 he was the recipient of a sabbatical fellowship from the American Philosophical Society.

Hook holds advanced degrees in mathematics, architecture, and piano performance as well as music theory. As a graduate student at Indiana University, he won a piano concerto competition and received an award for outstanding teaching. He has taught mathematics at Florida International University and music theory at Penn State University. He also has worked as an architect and structural engineer in Chicago, and has performed chamber music on several occasions with members of the Chicago Symphony Orchestra.

Music as a Mathematician's Playground

Tuesday, February 25, 2020
3:30 – 4:30 p.m.
UNIV 119

Music unfolds on a vast playing field whose complex mathematical structure has never been well understood. This talk will illustrate applications of several different branches of mathematics in describing musical phenomena. Emphasis will be on applications of graph theory, particularly in describing various versions of a diagram called a *Tonnetz* in which certain musical pitch relationships can be graphed and certain kinds of chord progressions can be traced. Some *Tonnetz* graphs are embedded in a torus; one version, for example, illustrates a toroidal embedding of the complete graph K_7. In some cases relationships between musical structures may be described algebraically using transformation groups, which range from familiar small cyclic groups to complex constructions such as wreath products. Relationships between scales of different cardinalities, such as diatonic (major or minor) scales with seven notes in each octave and chromatic scales with twelve, exhibit many mathematically interesting properties. Other ways of conceiving of chordal relationships lead to topological descriptions in which, for example, all possible two-note chords define a Möbius strip while larger chords lie in more complex spaces (orbifolds) in higher dimensions.

(Host: Birgit Kaufmann)

PURDUE UNIVERSITY Discovery Park