



## Departmental PhD Thesis Exam

Wednesday, September 3, 2025, at 10:00 a.m.  
(sharp) via Zoom / BA6290B

PhD Candidate : Caleb Jonker

Supervisor : Marco Gualtieri

Thesis title : Curvatures in generalized Kähler geometry



### Abstract

Bi-Hermitian is an extension of Kähler geometry which arose first in the study of supersymmetric  $\sigma$ -models in the 1980s. It was later rediscovered by Gualtieri, within Hitchin's generalized geometry program, and rechristened as generalized Kähler geometry. In this thesis, we study a wide variety of curvatures that appear in generalized Kähler geometry.

Using the structure provided by the generalized Kähler geometry we identify Chern connections on the canonical bundles of the generalized complex structures and relate these to the Bismut connections of the underlying bi-Hermitian manifold. We then identify these connections as components of generalized Chern connections and as a result obtain symmetries of the generalized complex structures which may be described in terms of bi-Hermitian data. We identify a second type of generalized Chern connection arising from the holomorphic Poisson structures present on any generalized Kähler manifold. Using a description of these involving bi-Hermitian data we give a novel reformulation of generalized Kähler-Ricci flow in terms of purely generalized geometric data.

The main tool that we use to accomplish this is the Roytenberg algebra, which is the algebra of functions on the graded symplectic manifold corresponding to the underlying Courant algebroid. We describe the structure inherited by the Roytenberg algebra in the presence of a generalized Kähler structure and give a characterization of the integrability condition in terms of the Roytenberg algebra.