



## Departmental PhD Thesis Exam

Friday, September 5th, 2025 at 10:00 a.m. (sharp)  
via Zoom / BA6180

PhD Candidate : Matt Koster

Supervisor : Eckhard Meinrenken

Thesis title : Flat symplectic bundles over a Riemann surface

### Abstract

We study flat projective symplectic bundles over closed Riemann surfaces. A Milnor-Wood type inequality is established using the Maslov index to classify the isomorphism classes of principal  $\mathrm{PSp}(2n; \mathbb{R})$ -bundles admitting a flat connection. Special attention is given to the case  $n = 1$  corresponding to  $\mathrm{PSL}_2(\mathbb{R})$  where explicit topological descriptions of commutator fibers are obtained, revealing their structure as 3-manifolds. This thesis also explores the interpretation of flat  $\mathrm{PSL}_2(\mathbb{R})$ -bundles in terms of singular hyperbolic geometry via holonomy representations, providing an explicit correspondence between flat connections and hyperbolic structures (with singularities). These geometric techniques are applied to analyze the maximal components of the moduli space where Teichmüller space is a distinguished connected component corresponding to maximal representations.