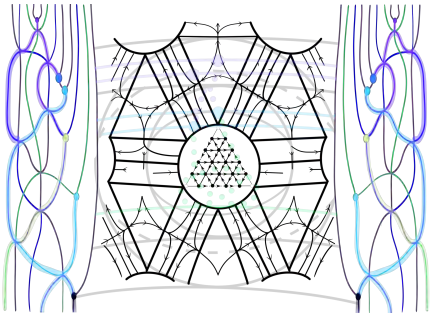
institute for pure & applied mathematics

Quantum Topology, Character Varieties and Low-Dimensional Geometry



September 23 - December 18, 2026

Scientific Overview

Quantum topology studies manifolds using invariants coming from quantum field theory. This program focuses on quantum invariants and their application to questions in geometry and low-dimensional topology such mapping class group representations, hyperbolic structures on three-manifolds, and smooth structures on four-manifolds.

The program will be centered around four streams: 1) character varieties and their quantum deformations 2) hyperbolic geometry and quantum invariants 3) contact geometry and cluster algebras 4) categorification in quantum topology.

Unifying these four streams is the formalism known as skein theory. Skein relations are elementary algebraic relations, typically encoded by embeddings of 1- and 2-dimensional singular submanifolds into ambient 2-, 3- or 4-manifolds, and equipped with various decorations informed by representation theory. Skein invariants provide an accessible point of entry: without a lot of background, a lot of the intuition in these areas can be conveyed by hand-drawn pictures. The streams all involve hands-on geometric and combinatorial constructions, cutting/gluing/TQFT-like properties, and computation via diagrams, which we hope will facilitate Rosetta-stone like translations between previously disjoint fields

Long Program

- Quantum topology, character varieties and low-dimensional geometry Opening Day : September 23, 2026
- Quantum topology, character varieties and low-dimensional geometry Tutorials : September 24-29, 2026
- Workshop I: Hyperbolic Structures and Quantum Invariants : October 12-15, 2026
- Workshop II: Contact Geometry, Cluster Algebras and Skein Theory : October 26-29, 2026
- Workshop III: Categorification in Quantum Topology : November 16-19, 2026
- Quantum topology, character varieties and low-dimensional geometry Culminating Retreat at Lake Arrowhead : December 13-18, 2026

Organizers

Daniel Douglas (Virginia Tech)
Ko Honda (UCLA)
David Jordan (University of Edinburgh)
Effie Kalfagianni (Michigan State University)
Aaron Lauda (University of Southern California (USC))
Ian Le (Australian National University)
Jessica Purcell (Monash University)
Paul Wedrich (University of Hamburg)

Participation

This long program will involve senior and junior researchers from several communities relevant to this program. You may apply for financial support to participate in the entire thirteen-week program, or a portion of it. We prefer participants who stay for the entire program. Applications will be accepted through Tuesday April 14, 2026 but offers may be made up to one year before the start date. We urge you to apply early. Mathematicians and scientists at all levels who are interested in this area of research are encouraged to apply for funding. Supporting the careers of women and minority researchers is an important component of IPAM's mission and we welcome their applications. More information and an application is available online.

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For more information, visit the program webpage:
www.ipam.ucla.edu/QT2026