

MATH-IMS Joint Pure Mathematics Colloquium Series The Chinese University of Hong Kong

This Colloquium Series in Pure Mathematics is organized by the Department of Mathematics and the Institute of Mathematical Sciences (IMS) at The Chinese University of Hong Kong. The series focuses on all areas of pure mathematics together with theoretical developments and applications.

Date: October 7, 2021 (Thursday)

Time: 10:00-11:00 (Hong Kong Time)

Zoom Link: <https://cuhk.zoom.us/j/98846779826>

The Cosmetic Surgery Conjecture and Heegaard Floer Homology

*Speaker: Professor Jonathan Hanselman
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Abstract: The cosmetic surgery conjecture is a basic open question concerning Dehn surgery on knots, a fundamental operation in low-dimensional topology. Generalizing the knot complement problem settled by Gordon and Luecke, it asserts that two different surgeries on the same knot never produce the same 3-manifold. I will give an overview of the conjecture and discuss some recent progress. I will also discuss the machinery behind these results, which is of independent interest. The work I will describe makes use of Heegaard Floer homology, a powerful suite of invariants for both 3-manifolds and knots. While these invariants have been around for nearly two decades, new results were facilitated by a recent reinterpretation of these invariants due to Rasmussen, Watson, and myself. In particular, there is an equivalence between the algebraic objects Heegaard Floer theory traditionally associates to knots and certain geometric objects---collections of immersed curves in the punctured torus. This leads to a beautiful interplay between algebraic and geometric techniques which, among many other applications, points to strong obstructions to cosmetic surgeries.

Bio: Prof. Jonathan Hanselman obtained his Ph.D. degree from Columbia University in 2014, after which he moved to University of Texas at Austin as an RTG instructor. He has been an assistant professor at Princeton University since 2017.