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

This MATH-IMS Joint 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 focus on all areas of pure mathematics together with theoretical developments and applications.

Date: March 18, 2021 (Thursday)
Time: 11:00am – noon (Hong Kong Time)
Zoom Link: https://cuhk.zoom.us/j/98846779826

The geometry of affine Schubert varieties and applications
Speaker: Professor Thomas Haines
University of Maryland, College Park

Abstract: Classical Schubert varieties are orbit-closures of a Borel subgroup acting on a partial flag variety attached to a connected reductive group. They play a central role in representation theory and combinatorics. Their geometric properties – whether they are normal, Cohen-Macaulay, or Frobenius-split; when they are singular, and what kind of singularities arise, etc – have been intensively studied and are now well understood. Affine Schubert varieties are similar objects but attached to a loop group rather than a group. They play a role in representation theory, mathematical physics, and in geometric approaches to automorphic forms. In the last 20 years they have been studied in large part because of their connection to certain Shimura varieties through the theory of Rapoport-Zink local models. But some key geometric properties – including normality – remain somewhat mysterious to this day, at least in some positive characteristic settings. This talk will survey some recent advances in the understanding of basic geometric properties of affine Schubert varieties, including the recently discovered surprising fact that "most" affine Schubert varieties in "bad" positive characteristic are not normal. We will indicate how these results are used to understand the geometry of certain Shimura varieties.

Bio: Prof. Haines obtained his Ph.D. degree in 1997 from the University of Chicago, under the direction of Prof. Robert Kottwitz. He is currently a full professor at the University of Maryland, College Park. Prof. Haines has previously held positions at the University of Toronto and the Institute for Advanced Study at Princeton. He was awarded the Sloan Fellow in 2004, and the Simons Research Fellowship in 2016. Prof. Haines is a leading expert in arithmetic geometry, with fundamental contributions to the study of Shimura varieties, automorphic forms, representations of p-adic groups and Langlands program.