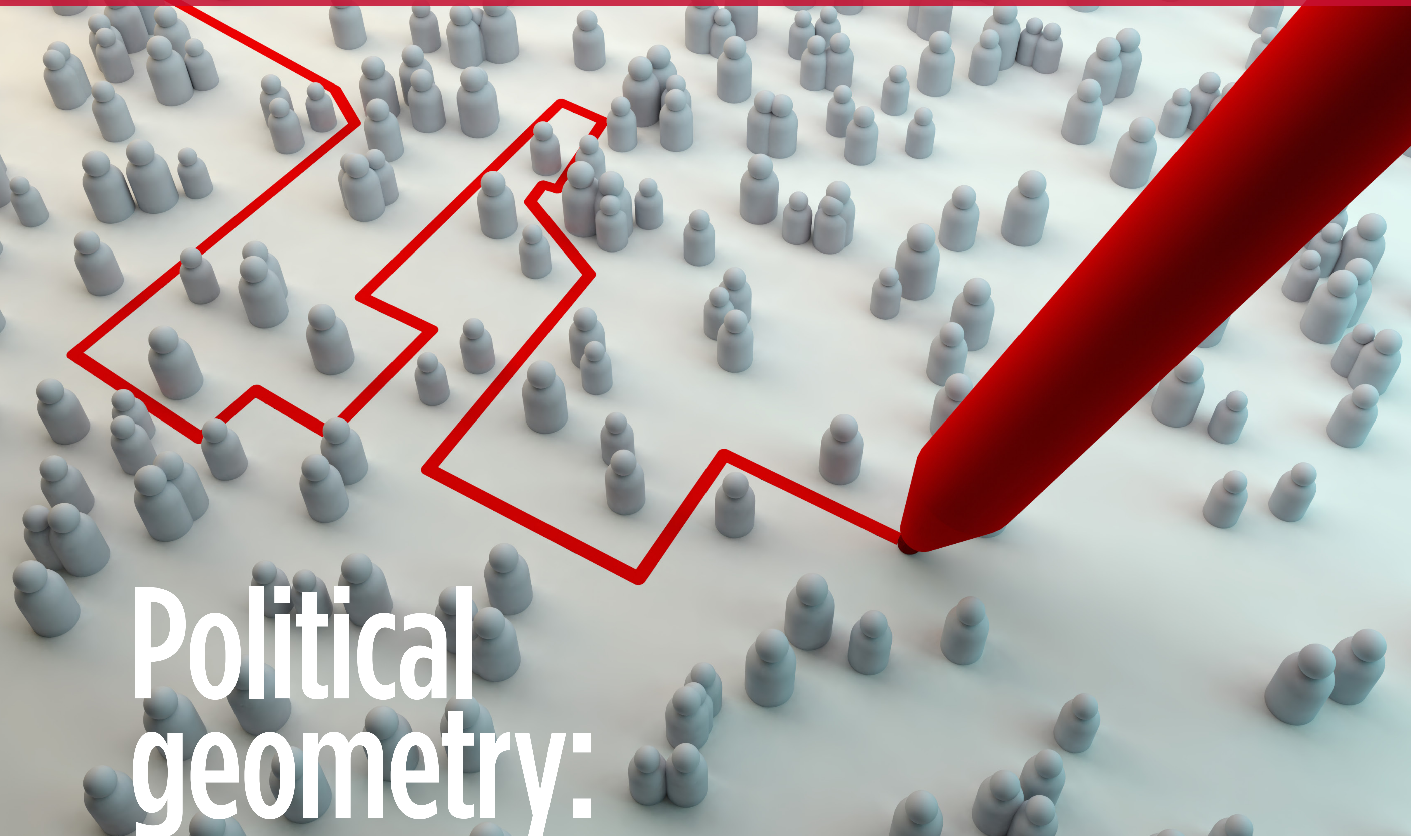
G. Milton Wing Lecture Series

October 2017



Political geometry:

What do shapes have to do with fair voting?

Monday, October 2, 5–6 p.m.,
140 Hutchison Hall (Lander Auditorium)
Public Lecture

The U.S. Constitution calls for a census every ten years, followed by freshly drawn congressional districts to evenly divide up the population of each state. How the lines are drawn has a profound impact on how the elections turn out, especially with increasingly fine-grained voter data available. We call a district gerrymandered if the lines are drawn to rig an outcome, whether to dilute the voting power of minorities, to overrepresent one political party, to create safe seats for incumbents, or anything else. Bizarrely shaped districts are widely recognized as a red flag for gerrymandering, so a traditional districting principle is that the shapes should be "compact"—since that typically is left undefined, it's hard to enforce or to study. I will discuss "compactness" from the point of view of metric geometry, and I'll overview opportunities for mathematical interventions and constraints in the highly contested process of electoral redistricting. To do this requires putting geometry in conversation with law, civil rights, political science, and supercomputing.

WITH GUEST LECTURER

Moon Duchin

Associate Professor in the Department of Mathematics and Director of the Program in Science, Technology, and Society at Tufts University

Sprawl and other dispersion metrics

Tuesday, October 3, 11:05 a.m.–12:05 p.m., 116 Wilmot Hall

I'll define a statistic called the "sprawl" of a metric measure space which quantifies the degree of rapid, homogeneous spreading out that is characteristic of trees. Related statistics come up across geometry, in group theory, in category theory, and in applications from biodiversity to gerrymandering. In this talk I'll spend some time on examples from convex geometry.

Can you hear the shape of a billiard table?

Tuesday, October 3, 2–3 p.m., 1106A Hylan Building

There are many ways to associate a spectrum of numbers to a surface: Two of the most classically studied are the eigenvalues of the Laplacian and the lengths of closed geodesics. People often ask whether two different surfaces can have the same spectrum of numbers, and there's a long and beautiful story attached to that question. Here's a twist on the setup: Now consider a polygon in the plane and label its sides with letters. Follow a billiard ball trajectory around the surface and record the "bounce sequence," or the sequence of labels hit by the ball as it moves. Is it possible for two different billiard tables to have all the same bounces?

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