Berlin Mathematical School

BMS Friday Colloquium

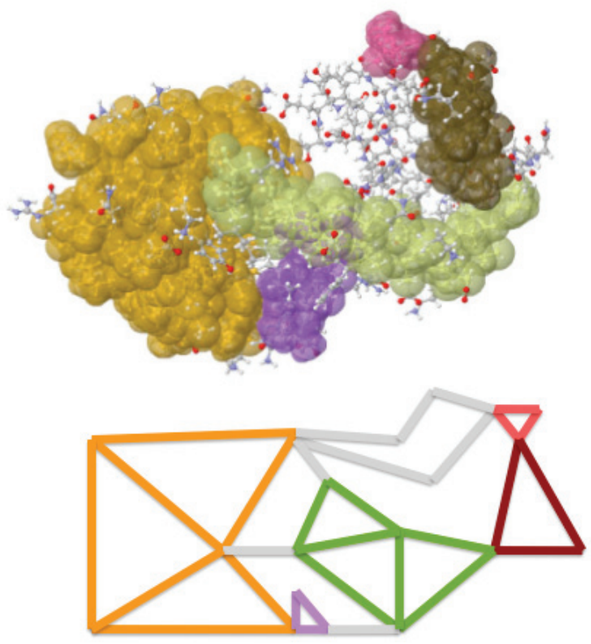
Friday 18 October 2013 at 14:15

Tea & Cookies starting at 13:00

BMS Loft, Urania, An der Urania 17, 10787 Berlin

Ileana Streinu

(Smith College)



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Degrees of Freedom

A robot arm, a piece of folded origami, a structural model of a protein, a polyhedral-shaped viral capsid or a crystalline framework material – these apparently unrelated objects are articulated systems. They possess intrinsic flexibility, captured by the number of independent parameters required to describe their motions: the degrees of freedom. By calculating their rigid components, we effectively reduce the dimensionality of the motion simulation problem – sometimes dramatically.

Modern approaches rely on a combinatorial condition formulated by James Clerk Maxwell in 1864 to describe the rigidity of frameworks of the simplest type, made from bars and joints. A hundred years later, this became a theorem – but only in dimension two. Its three-dimensional counterpart remains elusive to this day.

In her talk, Streinu will present a personal selection of new approaches, results and applications of rigidity theory, using a variety of props to help build the 3D intuitions necessary to appreciate the beauty of the geometric questions. The proofs use modern insights from discrete mathematics (graph theory, matroid theory, computational geometry), combined with classical perspectives from algebraic geometry.

Ileana Streinu is a Romanian-American computer scientist and mathematician at Smith College in Massachusetts, USA. Her main area of research is Combinatorial and Computational Geometry. Streinu gained two doctorates in 1994, one in mathematics and computer science from the University of Bucharest and one in computer science from Rutgers University, USA. She joined the Smith computer science department in 1994 and became the Charles N. Clark Professor in 2009.

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