
An invitation to low-dimensional topology
Une invitation à la topologie de basse dimension
(Org: **Adam Clay** (University of Manitoba) and/et **Patrick Naylor** (McMaster University))

HANS BODEN, McMaster University

Splitting the difference in the ribbon-slice conjecture

Some time ago, Ralph Fox asked whether every slice knot is ribbon. This innocent question morphed into the ribbon-slice conjecture, despite the fact no one seems to believe it is true. I will discuss two ways to divide Fox's question into two open problems using (a) virtual knots (b) ribbon 2-knots. This approach has been an effective method for converting an intractable problem into several intractable problems.

MAXIME FORTIER BOURQUE, Université de Montréal

What are the best hyperbolic surfaces?

I will survey some extremal problems on moduli spaces that ask which hyperbolic surfaces maximize or minimize various geometric invariants. Examples include the size of the isometry group, the diameter, the length and number of shortest closed geodesics, and the value and multiplicity of the first positive eigenvalue of the Laplacian.

STEVE BOYER, UQAM

Do 3-manifolds with taut foliations have orderable fundamental groups?

The L-space conjecture contends, in part, that if a closed, orientable 3-manifold admits a taut foliation then its fundamental group admits a left-invariant total order (i.e. it is left-orderable). Though known in many cases, the contention remains widely open. In this talk I will survey what is known about this problem and describe some recent work with Cameron McA. Gordon, Ying Hu, and Duncan McCoy which shows the connection between foliations and left-orders contended by the L-space conjecture is not as direct as might have been hoped.

TYRONE GHASWALA, University of Waterloo

Does the Loch Ness Monster's mapping class group even have a finite-index subgroup?

The study of mapping class groups of infinite-type surfaces (so called big mapping class groups) has enjoyed a surge of interest in the past decade or so. Remarkably, the seemingly innocent question in the title of this talk remains stubbornly unresolved. I will motivate the question, introducing the relevant results from the study of infinite-type surfaces, with the aim of convincing you it's a compelling question! I will not assume familiarity with big mapping class groups.

I have thought about the question on and off for the past few years, and I invite, with open arms, any ideas anyone may have!

OFFICE HOURS,

OFFICE HOURS,

DUNCAN MCCOY, UQAM

Calculating the unknotting number (sometimes)

The unknotting number is simultaneously one of the simplest classical knot invariants to define and one of the most challenging to compute. This intractability stems from the fact that typically one has no idea which diagrams admit a collection of crossing changes realizing the unknotting number for a given knot. I will discuss some (mostly false) conjectures concerning the behaviour of the unknotting number as well as a smattering of positive results.

KASRA RAFI, University of Toronto

From Mirzakhani's Volumes to Random Surfaces

We will explore what it means to choose a random geometric surface, using natural probability measures on moduli space, and describe some of the limiting geometric phenomena that emerge for high genus surfaces. In this setting, many geometric features stabilize as the genus tends to infinity and, somewhat paradoxically, become easier to describe and compute, for example the distribution of short geodesics and the geometry of a typical neighborhood of a random point. This perspective was initiated by Mirzakhani, who used Weil-Petersson volume to define a natural notion of a random hyperbolic surface and to calculate expected values of various geometric quantities. I will explain these ideas and then discuss analogous questions and results for flat surfaces, highlighting connections between geometry, dynamics and low-dimensional topology.

YVON VERBERNE, The University of Western Ontario

Grand arcs and the Nielsen-Thurston Classification

The Nielsen-Thurston classification tells us that the elements in the mapping class group of a finite type surface are either finite order, reducible, or pseudo-Anosov. We discuss this classification and how to obtain a similar classification theorem when one considers the action of the mapping class group on a combinatorial complex. In the case of infinite type surfaces, the question of what a classification type theorem for elements in the mapping class group would be is open. In this talk, we will discuss what a generalization of a pseudo-Anosov mapping class may be in the context of the action of the mapping class group on a combinatorial complex, and open problems which surround this approach.

C.M. MICHAEL WONG, University of Ottawa

Ribbon cobordisms

The Slice-Ribbon Conjecture states that, given a smooth concordance (a smooth cobordism that is a cylinder) between a knot and the unknot, one can always find a Morse function on it with only index-0 and index-1, but no index-2, critical points. That it is not obviously false is one of the reasons that 4-dimensional topology is so strange. In this talk, I will briefly survey the history of this conjecture and explain some progress in the past few years as well as some connections to contact topology.