

Titles and Abstracts

1. Vincent Alberge, University Strasbourg, France

Title: On Reduced Compactifications of Teichmüller Space

Abstract: Teichmüller space of a hyperbolic surface of finite area has many different compactifications, as the Teichmüller compactification, the Thurston compactification or the Gardiner-Masur compactification. In all of these compactifications, boundary points can be viewed as continuous maps and then, they have a well defined null-set. On each such boundaries, the null-set defines an equivalent relation and by considering corresponding quotient spaces, we get what we call the reduced compactifications of Teichmüller space. In this talk, we will investigate on relationship between these reduced compactifications and we will show that the group of auto-homeomorphisms of the reduced Thurston boundary is canonically isomorphic (except for exceptional cases) to the extended mapping class group.

This is joint work with Prof. Miyachi and Prof. Ohshika.

2. Javier Aramayona, University of Toulouse, France

Title: On the Automorphism Group of a Right-Angled Artin Group

Abstract: Automorphism groups of right-angled Artin groups form an interesting class of groups, as they interpolate between the two extremal cases of $\text{Aut}(F_n)$ and $\text{GL}(n, \mathbb{Z})$. In this talk we will discuss some conditions on a simplicial graph which imply that the automorphism group of the associated rightangled Artin group has (in)finite abelianization. As a direct consequence, we obtain families of such automorphism groups that do not have Kazhdan's property (T). This is joint work with Conchita Martinez-Perez.

3. Ara Basmajian, City University of New York, USA

Title: Equations over deformation spaces

Abstract: Let X be a compact hyperbolic surface with either geodesic or horocyclic boundary. The homotopy class (rel the boundary) of a non-trivial arc from the boundary to itself can be realized by an orthogeodesic- a geodesic segment perpendicular to the boundary at its initial and terminal points. This talk is about a special subclass of orthogeodesics called prime orthogeodesics. In work with Hugo Parlier and Ser Peow Tan we show that the prime orthogeodesics arise naturally in the study of maximal immersed pairs of pants in X and are intimately connected to regions of X in the complement of the natural collars. These considerations lead to continuous families of equations (so called identities) that remain constant on the deformation space of hyperbolic structures.

4. Martin Bridgeman, Boston College, USA

Title: Bounds on renormalized volume for convex co-compact hyperbolic 3-manifolds

Abstract: We consider convex cocompact hyperbolic 3-manifolds and compare the

convex core volume $VC(M)$ to their renormalized volume $VR(M)$. We show that they differ by a constant which depends only on the injectivity radius of the Poincaré metric on the domain of discontinuity generalizing a recent result of Schlenker in the quasifuchsian case. We further show that the difference necessarily tends to infinity as the injectivity radius tends to zero and obtain an optimal description of the rate of divergence as the injectivity radius tends to zero. This is joint work with R. Canary.

5. François Fillastre, Université de Cergy–Pontoise, France

Title: Some applications of Lorentzian geometry to Teichmüller space

Abstract: We will briefly review some distinguished maps between two hyperbolic compact surfaces: earthquakes, minimal Lagrangian diffeomorphisms, rotations and landslides (introduced by Bonsante–Mondello–Schlenker), and “flips” of particular cellulations of the surfaces. The existence of these maps is equivalent to the existence of particular convex sets in the 3d Anti-de Sitter space.

6. Ren Guo, Oregon State University, USA

Title: Spaces of polyhedral metrics and Teichmüller spaces

Abstract: The space of Euclidean/spherical/hyperbolic polyhedral metrics on a surface with cone points is the set of all equivalence classes of Euclidean/spherical/hyperbolic polyhedral metrics on the surface. The decorated Teichmüller space is the set of all decorated hyperbolic metric on the surface minus the cone points up to isometry isotopic to the identity map. The Teichmüller space of a surface with boundary is the space of all equivalence classes of hyperbolic metrics with geodesic boundary on the surface minus the cone points. The five spaces of metrics or a certain subspaces are C^1 -diffeomorphic to each other. The diffeomorphisms are equivariant under the action of the mapping class group.

7. Hengnan Hu, University of Luxembourg, Luxembourg

Title: Polynomial automorphisms of C^n preserving the Markoff-Hurwitz polynomial

Abstract: In this talk, the study of the Markoff polynomial $x^2 + y^2 + z^2 - xyz$ under the action of the group of polynomial automorphisms which is commensurable to the action of $Out(F_2)$ on the character variety

$$\text{Hom}(F_2, \text{SL}(2, C)) // \text{SL}(2, C)$$

is generalized to the following polynomial (with $n \geq 3$)

$$x_1^2 + x_2^2 + \dots + x_n^2 - x_1 x_2 \dots x_n,$$

which is called the Markoff-Hurwitz polynomial. Our main results include the determination of the group of polynomial automorphisms, the description of a non-empty open subset of C^n on which the group acts properly discontinuously (domain of discontinuity), and identities for the orbit of points in the domain of discontinuity.

8. Yi Huang, Melbourne University, Australia
Title: Ford domain deformations for 3-cusped projective planes
Abstract: In the 70's, Jørgensen studied Ford domains of 3-manifolds arising from quasi-Fuchsian once-punctured torus representations and described how the combinatorial structure of their canonical triangulations (dual to the Ford domains) vary over the quasi-Fuchsian character variety. We give a gentle overview of this work, before considering an analogous theory for quasi-Fuchsian thrice-punctured projective plane representations.
9. Zheng Huang, City University of New York, USA
Title: Closed Minimal Surfaces In Hyperbolic Three-Manifolds
Abstract: Minimal surfaces are fundamental objects in geometry. We examine natural questions of existence and uniqueness of closed, incompressible minimal surfaces in various settings of hyperbolic three-manifolds. This is based on joint work with B. Wang.
10. Sang-Hyun Kim, Seoul National University, Korea
Title: Acute Triangulations of the Sphere
Abstract: We prove that a combinatorial triangulation L of a sphere admits an acute geodesic triangulation if and only if L does not have a separating three- or four-cycle. The backward direction is an easy consequence of the Andreev-Thurston theorem on orthogonal circle packings. For the forward direction, we consider the Davis manifold M from L . The acuteness of L will provide M with a CAT(-1) (hence, hyperbolic) metric. As a non-trivial example, we show the non-existence of an acute realization for an abstract triangulation suggested by Oum; the degrees of the vertices in that triangulation are all larger than four. This approach generalizes to triangulations coming from more general Coxeter groups, and also to planar triangulations. (Joint work with Genevieve Walsh)
11. In Kang Kim, Korea Institute for Advanced Study, Korea
Title: Kähler metric on the space of strictly convex real projective structures on surface
Abstract: We prove the existence of mapping class group invariant Kähler metric on the space of strictly convex real projective structures on a closed surface. This is a joint work with G. Zhang.
12. Thomas Koberda, Yale University, USA
Title: Exotic quotients of surface groups
Abstract: I will explain how to use TQFT representations of mapping class groups to produce linear representations of surface groups in which every simple closed curve has finite order, but which have infinite image. As a corollary, I will show how to produce covers of surfaces where the integral homology is not generated by pullbacks of simple closed curves on the base. This talk represents joint work

with R. Santharoubane.

13. Qiongling Li (QGM-Caltech), Rice University, USA

Title: AdS 3-manifolds and Higgs bundles

Abstract: In this talk we investigate the relationships between closed AdS 3-manifolds and Higgs bundles. We have a new way to construct AdS structures using Higgs bundle techniques that allows us to see many of their properties explicitly. We also find applications to the theory of minimal immersions into quadrics with their natural pseudo-Riemannian structure: using the geometry of the AdS manifolds we can characterize the representations admitting equivariant minimal immersions of the Poincare disc into the Klein quadric, the Grassmannian $Gr(2,4)$. This is joint work with Daniele Alessandrini.

14. Jinsong Liu, Chinese Academy of Sciences, Beijing

Title: Deformation of circle patterns and its applications

Abstract: Given a circle pattern on the Riemann sphere $\hat{\mathbb{C}}$, in this talk we prove that its quasiconformal deformation space can be naturally identified with the product of the Teichmüller spaces of its interstices.

By using the intersection number technique, together with Teichmüller theory of packings, we provides an alternative approach to the Midscribability Theorem. Furthermore, by combining Schramm's method with the above ones, we obtain a rigidity result as well. Furthermore, by using these methods, we shall investigate the stability of some inscribable graphs.

15. Feng Luo, Rutgers University, USA

Title: Rigidity of the hexagonal triangulation of the plane and its applications

Abstract: As part of his work on circle packing and its convergence to the Riemann mapping, Thurston conjectured that the hexagonal circle packing of the plane is rigid. Thurston's conjecture was established by Rodin and Sullivan in 1987. We show the counterpart of Thurston's conjecture holds for the hexagonal triangulation of the plane. As a consequence, we show that discrete conformal maps converge to the Riemann mapping. This is a joint work with J. Sun and T. Wu.

16. Jiming Ma, Fudan University, China

Title: Hyperbolicities of trip-3 and T-4 Lorenz knots

Abstract: We will classify trip-3 and T-4 Lorenz knots into torus knots, satellite knots and hyperbolic knots. The proofs depends on the Dehornoy floor theory and the Garside structure on braid groups.

17. Greg McShane, Institut Fourier, Grenoble, France

Title: Degeneration of metrics on a surface and identities for lengths

Abstract: We will discuss the length spectrum of a surface with boundary viewed as moduli of the surface. We will study two cases: the first where the boundary

length goes to zero then 2π and the second when the boundary length goes to infinity. Finally we relate this to questions concerning Weil-Petersson volumes.

18. Hideki Miyachi, Osaka University, Japan

Title: Toward the Complex Geometry on Teichmüller Space with Extremal Length
Abstract: In this talk, I will discuss a complex analytic property of the extremal length functions on Teichmüller space. I will give a concrete formula of the Levi forms of the extremal length functions in generic case, and show that the reciprocals of the extremal length functions are plurisuperharmonic. As a corollary, we obtain an alternative proof of L. Liu and W. Su's result that the extremal length functions are plurisubharmonic. We also give an alternative proof of S. Krushkal's result that the Teichmüller distance from a reference point is plurisubharmonic.

19. Hugo Parlier, University of Fribourg, Switzerland (尽量不安排报告)

Title: Curve and arc graphs for infinite type surfaces.

Abstract: Curve, arc and pants graphs have been useful tools for studying the large scale geometry of Teichmüller spaces and mapping class groups for finite surfaces. This talk will be about ways to define and study analogous objects for infinite type surfaces.

Based on joint work with J. Aramayona and A. Fossas.

20. Riufeng Qiu, East China Normal University

Title: On distance of Heegaard splitting

Abstract: In this talk, I will introduce some results and questions on the relations between distance of Heegaard splitting and geometric and topological properties of 3-manifolds.

21. Xiaofeng Sun, Lehigh University, USA

Title: Plurisubharmonic Functions on Teichmüller Spaces

Abstract: Pseudoconvexity is an important property of Teichmüller Spaces. Geometric consequences such as the existence of Kähler-Einstein metrics follow from it. The Teichmüller Spaces of hyperbolic Riemann surfaces are pseudoconvex and there are a few constructions of plurisubharmonic exhaustion functions on them, for example, by using geodesic length function on the Riemann surfaces. Toledo constructed a plurisubharmonic function by using the energy of harmonic maps. In this talk we generalize Toledo's work and describe a plurisubharmonic function on the Teichmüller Spaces of higher dimensional Kähler-Einstein manifolds of general type. We will also discuss geometric consequences such as the Mumford stability of the logarithmic cotangent bundle of the moduli spaces.

22. Zhe Sun, Max Planck Inst Germany

Title: Rank n swapping algebra and Fock-Goncharov coordinates

Abstract: Swapping algebra, introduced by F. Labourie, is an abstract Poisson

algebra defined through pair of points on a circle. F. Labourie relates, through the weak cross ratios, the swapping algebra to the Atiyah-Bott-Goldman symplectic structure on the universal (in genus) Hitchin space and to the Drinfeld-Sokolov reduction on the space of realopers with trivial holonomy for any $\mathbf{PSL}(n, \mathbb{R})$ where $n > 1$. In this talk, I will introduce the quotient of the swapping algebra by $(n+1) \times (n+1)$ determinants---rank n swapping algebra which is related to the $\mathbf{PSL}(n, \mathbb{R})$ Hitchin component for a fixed n . The main result is the following, let D_k be a disc with k special points on the boundary, the Fock-Goncharov's coordinate fraction ring for $X(D_k, \mathbf{PSL}(n, \mathbb{R}))$ is Poisson embedded into the fraction algebra of the rank n swapping algebra. I will give a quantization of the rank n swapping algebra. Moreover, there is a quantized version of the above embedding. I will discuss general surface cases and its natural compactification and possible TQFT if time permitted.

23. Makoto Sakuma, Hiroshima University, Japan

Title: Parabolic generating pairs of 2-bridge link groups and Heckoid groups.

Abstract: At a conference in Budapest in 2002, Ian Agol announced (i) classification of non-free Kleinian groups generated by two parabolic transformations, and (ii) classification of parabolic generating pairs of each of such groups. In the first part of this talk, I will talk about an approach to an alternative proof of the result (ii) by using small cancellation theory, Alexander invariants, and a geometric observation suggested by Michel Boileau (joint work with Shunsuke Aimi and Donghi Lee). In the second part of the talk, I will explain Agol's beautiful geometric argument by using checkerboard surfaces and Klein combination theorem.

24. Binbin Xu, Institut Fourier, Grenoble, France

Title: Pressure metric on the Teichmüller space of surfaces with boundary.

Abstract: Let S be an oriented compact surface with negative Euler characteristic. Teichmüller space of S is the space of isotopy classes of the space of marked hyperbolic structures on S . There is a well-known Riemannian metric on the Teichmüller space, called the Weil-Petersson metric. It has many interesting properties, for example: Kähler, negatively curved, incomplete, geodesically convex, etc. When S is closed, this metric can be interpreted as the pressure metric by using the thermodynamic formalism. When S has boundary, both of these two metrics are still well-defined but the relation between them are not known yet. By studying the incompleteness of the pressure metric in the second case, we are capable to answer that they are not equivalent to each other.

25. Sumio Yamada, Gakushuin University, Japan

Title: Deformation of right-angled hexagons and Thurston/Arc metrics on Teichmüller space.

Abstract: In this talk, we introduce a new class of deformations of hyperbolic right-angled hexagons. Right-angled hexagons are important in "triangulating" a

hyperbolic surface with totally geodesic boundary components, and we apply our deformation of hexagons to the Teichmuller theory of surface with boundary. This is a collaborative work with Athanase Papadopoulos.

26. Wenyuan Yang, Xi'an Jiaotong University, China

Title: Hausdorff dimension of boundaries of a relatively hyperbolic group.

Abstract: In this talk, we will discuss the Floyd and Bowditch boundaries of a relatively hyperbolic group and compute the Hausdorff dimension with respect to the Floyd metric and shortcut metric respectively. Our main result is that Hausdorff dimension of boundaries is identified with the growth rate of the group, up to a multiplicative constant. In fact we compute the Hausdorff dimension of the set of uniformly conical points in the boundary, which turns out to be the same as that of the whole boundary. On the other hand, we show that the set of uniformly conical points is a null set with respect to Patterson-Sullivan measures. This is joint work with Leonid Potyagailo.

27. Tian Yang, Stanford University, USA

Title: On type-preserving representations of the four-punctured sphere group.

Abstract: We give counterexamples to a conjecture of Bowditch that if a non-elementary type-preserving representation $\rho: \pi_1(\Sigma_{g,n}) \rightarrow PSL(2; R)$ of a punctured surface group sends every non-peripheral simple closed curve to a hyperbolic element, then ρ must be Fuchsian. The counterexamples come from relative Euler class ± 1 representations of the four-punctured sphere group. As a related result, we show that the mapping class group action on each non-extremal component of the character space of type-preserving representations of the four-punctured sphere group is ergodic. The main tool we use is Penner's lengths coordinates of the decorated character spaces defined by Kashaev.

28. Ying Zhang, Soochow University, China

Title: Minimizing a pair of intersecting simple closed geodesics in relative Teichmuller spaces of the once punctured torus

Abstract: We address the problem of minimizing a pair of k times intersecting (for fixed integer $k \geq 1$) simple closed geodesics in once punctured hyperbolic tori with fixed boundary data.