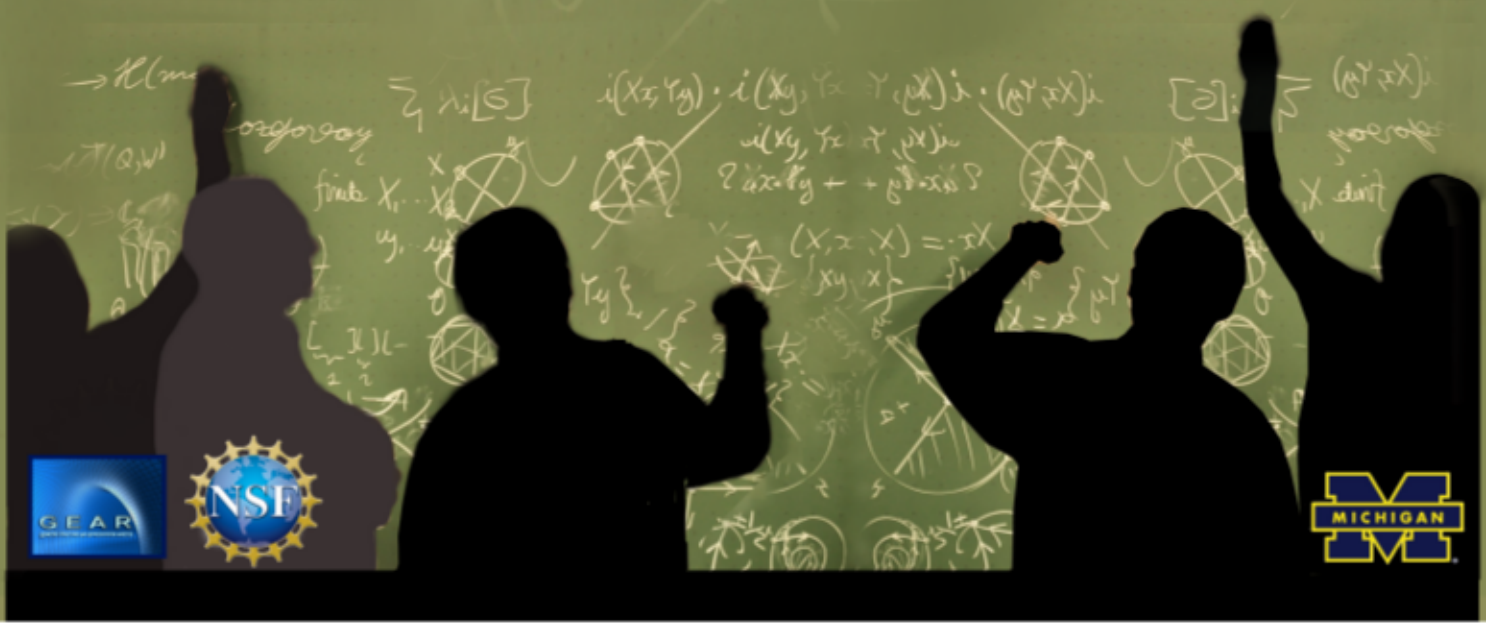
GEAR
Junior Retreat

University of Michigan at Ann Arbor
23 May to 1 June 2014



INDEX

Welcome Message

Dear Colleagues, Welcome to the Second Junior Retreat of GEAR, one of the National Science Foundation's Research Networks in Mathematical Sciences (RNMS). The acronym GEAR stands for GEometric structures And Representation varieties and reflects the mathematical focus of the network and its members. The GEAR Network brings together researchers from 46 nodes in the U.S., Canada and Europe. Its goal is to promote research interactions between network members, to facilitate cross-pollination of ideas between different research communities, and to train students and researchers to cross traditional mathematical boundaries. This is accomplished via:

- Short term visits
- Exchanges
- Workshops
- Graduate internships
- Summer research experiences for graduate students

The GEAR Junior Retreat is designed is to build bridges between the different interest groups in the network - and more broadly among mathematicians working in areas relating to GEometric structures And Representation varieties. The meeting is mainly aimed at PhD students and recent post-docs, and during the ten days the following themes will be featured:

- Dynamics on Moduli Spaces
- Geometric and Analytical Group Theory
- Geometric Structures and Teichmïuler Spaces
- Higgs Bundles
- Hyperbolic manifolds

During the mornings there will be 8 mini-courses on topics related to the above theme, aiming to introduce the audience to current developments in the area. Each mini-course will have an exercise session, as well as an open problems discussion hour, during which experts in the field shall present and expand on open questions in each area. During the afternoons there will be short talks by young researchers on topics related to the above themes. We welcome your comments and suggestions on any issues related to the network. There will be a welcoming reception Friday May 23 at 7:00 pm, a picnic on Monday May 26 at 7:00 pm and a BBQ on Friday May 30 starting at 7:00 pm. We hope you will attend these events and make new acquaintances among the GEAR members. Enjoy the conference, and keep in touch with GEAR activities at our website: gear.math.illinois.edu

Michelle Lee, Sara Maloni, Andy Sanders, Laura Schaposnik.

On behalf of the Junior GEAR Retreat committee:

Dick Canary
Steve Kerckhoff
Michelle Lee
Ben Linowitz
Sara Maloni
Andy Sanders
Laura Schaposnik
Anna Wienhard

Welcome Message
GEAR Director

Welcome to the second GEAR Junior Retreat!

On behalf of the GEAR Executive Committee, it's a real pleasure to acknowledge the fantastic job that the Junior Retreat organizers (Andy, Laura, Sara, and Michelle) have done. They have worked tirelessly and with great imagination to construct a program that perfectly captures the spirit of the GEAR Network, fulfils the goals of its Junior Retreats - and promises to be great fun.

We hope you take full advantage of the opportunities at the Junior Retreat to learn more about the many facets of GEAR's eponymous mathematical core, namely GEometric structures And Representation varieties, and also to broaden your circle of friends and colleagues within the Network.

Beyond the Junior Retreat, we encourage you to exploit GEAR's existing programs to interact with GEAR members throughout the Network. Also, please don't hesitate to send us your ideas for new programs or better ways to use GEAR resources.

Steve Bradlow (Director of GEAR)

P.S. Don't forget to include the GEAR Acknowledgement (see http://gear.math.illinois.edu) in publications that refer to work supported in any way by the GEAR Network.

Location

The Junior GEAR Retreat will take place at the following location:

DANA Building/School of Natural Resources and the Environment
440 Church Street Ann Arbor, MI 48109.

- The mini-courses and Senior Talks will take place in room 1040.
- The parallel sessions and exercise sessions will take place in room 1024, 1028, 1046.
- The open problem sessions will be in room 1040.
- Room 1046 can be used for private (Maths) discussions.

Note: On Saturdays, Sundays and Memorial Day (Monday 26) the building is open from 7:30 am to 3:00 pm. So after 3:00 pm the exterior door of the building can be open only from inside. If you exit the building, please make your own arrangements to be able to enter.

In case of an **emergency**, you can reach us through the following numbers:

- Michelle: 609-203-6810.
- Sara: 401-527-2994.
- Andy: 951-532-1286.
- Laura: 217-898-1674.

Friday, May 23

8:00 - 8:45	**Breakfast/Registration (Ford common room)**
8:45 - 9:00	Welcome words by Steve Kerckhoff (1040) (Executive member of GEAR, Stanford University).
9:00 - 10:30	DAVID DUMAS (University of Illinois at Chicago) (1040) *Complex projective structures and their holonomy limits I.*
10:30 - 11:00	**Coffee Break**
11:00 - 12:30	JOHN PARKER (Durham University) (1040) *Complex hyperbolic geometry and quasi-Fuchsian groups I.*
12:30 - 14:00	**Lunch Break**
14:00 - 15:00	SUBHOJOY GUPTA (Caltech) (1040) *Real reflections, commutators and cross-ratios in complex hyperbolic space.*
15:00 - 15:30	**Coffee Break**
15:30 - 16:45	Exercise Session for David Dumas (1024). Open Problem Session for David Dumas (1040). Exercise Session for John Parker (1028) Open Problem Session for John Parker (1040).
19:00 - 21:00	**WELCOME RECEPTION (Mathematics Department)**.

Saturday, May 24

8:30 - 9:00 **Breakfast (Ford common room)**

9:00 - 10:30 JOHN PARKER (Durham University) (1040)
Complex hyperbolic geometry and quasi-Fuchsian groups II.

10:30 - 11:00 **Coffee Break**

11:00 - 12:30 DAVID DUMAS (University of Illinois at Chicago) (1040)
Complex projective structures and their holonomy limits II.

12:30 - 14:00 **Lunch Break**

14:00 - 15:00 JULIEN PAUPERT (Arizona State University) (1040)
Real reflections, commutators and cross-ratios in complex hyperbolic space.

15:00 - 15:30 KRZYSZTOF SWIECICKI (Texas A&M University) (1024)
Helly's theorem for systolic complexes.

ANDREW ZIMMER (University of Michigan) (1028)
Rigidity of convex divisible sets.

NICHOLAS G. VLAMIS (Boston College) (1046)
Quasiconformal Homogeneity, mapping class groups, and a counting problem in Teichmüller space.

15:30 - 16:00 **Coffee Break**

16:00 - 16:30 ANTON LUKYANENKO (UIUC) (1024)
Heisenberg geometry and quasi-conformal mappings.

YULAN QING (Technion-Israel) (1028)
Roller Boundary of CAT(0) Cube Complex.

16:30 - 16:45 **Short Break**

16:45 - 18:00 Exercise Session for David Dumas (1024).
Open Problem Session for David Dumas (1040).

Exercise Session for John Parker (1028).
Open Problem Session for John Parker (1040).

Sunday, May 25

8:30 - 9:00	**Breakfast (Ford common room)**
9:00 - 10:30	KIM RUANE (Tufts University) (1040) *Boundaries of CAT(0) Groups and Spaces I.*
10:30 - 11:00	**Coffee Break**
11:00 - 12:30	MARTIN BRIDGEMAN (Boston College) (1040) *Geodesic flows, convex Anosov representations and pressure metrics I.*
12:30 - 14:00	**Lunch Break**
14:00 - 15:00	JOHANNA MANGHAS (Brown University) (1040) *Purely loxodromic subgroups of right-angled Artin groups.*
15:00 - 15:30	ALEKSANDR KOLPAKOV (Vanderbilt University) (1024) *Colourings of polytopes and hyperbolic 4-manifolds.*
	SAM TAYLOR (Unoversity of Texas at Austin) (1028) *Convex cocompactness and stability in mapping class groups.*
15:30 - 16:00	**Coffee Break**
16:00 - 16:30	ANTOINE CLAIS (University of Lille 1) (1024) *Combinatorial Loewner Property on boundaries of hyperbolic groups.*
	TENGREN ZHANG (University of Michigan) (1028) *Degeneration of Convex RP^2 structures on surfaces.*
16:30 - 16:45	**Short Break**
16:45 - 18:00	Exercise Session for Martin Bridgeman (1024). Open Problem Session for Martin Bridgeman (1040).
	Exercise Session for Kim Ruane (1028). Open Problem Session for Kim Ruane(1040).

Monday, May 24

8:30 - 9:00	**Breakfast (Ford common room)**
9:00 - 10:30	MARTIN BRIDGEMAN (Boston College) (1040) *Geodesic flows, convex Anosov representations and pressure metrics II.*
10:30 - 11:00	**Coffee Break**
11:00 - 12:30	KIM RUANE (Tufts University) (1040) *Boundaries of CAT(0) Groups and Spaces II.*
12:30 - 14:00	**Lunch Break**
14:00 - 15:00	DUC MANH NGUYEN (University of Bordeaux 1) (1040) *Cylinder decompositions and $GL(2,\mathbb{R})$-orbit closures of genus three translation surfaces.*
15:00 - 15:30	**Coffee Break**
15:30 - 16:30	ANNE PARREAU (Institut Fourier, Grenoble) (1040) *Compactification of representation spaces through length functions.*
16:30 - 16:45	**Short Break**
16:45 - 18:00	Exercise Session for Martin Bridgeman (1024). Open Problem Session for Martin Bridgeman (1040). Exercise Session for Kim Ruane (1028). Open Problem Session for Kim Ruane (1040).
19:00-21:00	**EVENING EVENT - PICNIC (Island Park)**.

Tuesday, May 27
Free Day

Wednesday, May 28

8:30 - 9:00 **Breakfast (Ford common room)**

9:00 - 10:30 YAIR MINSKY (Yale University) (1040)
Curves, surfaces and hyperbolic 3-manifolds I.

10:30 - 11:00 **Coffee Break**

11:00 - 12:30 SERGEI GUKOV (Caltech) (1040)
Quantization via Mirror Symmetry I.

12:30 - 14:00 **Lunch Break**

14:00 - 15:00 SEBASTIAN HENSEL (University of Chicago) (1040)
The set of uniquely ergodic interval exchange transformations is path-connected.

15:00 - 15:30 SER-WEI FU (UIUC) (1024)
Length spectral rigidity for strata of flat metrics.

KENJI KOZAI (University of California, Berkeley) (1028)
Hyperbolic structures from Sol.

ANA PEON-NIETO (University of Heidelberg) (1046)
Higgs bundles and cameral covers.

15:30 - 16:00 **Coffee Break**

16:00-16:30 MARCO SPINACI (Institut Fourier, Grenoble) (1024)
Deformations of twisted harmonic maps.

RICHARD WEBB (University of Warwick) (1028)
Effective Masur-Minsky Theory.

16:30 - 16:45 **Short Break**

16:45 - 18:00 Exercise Session for Sergei Gukov (1024).
Open Problem Session for Sergei Gukov (1040).

Exercise Session for Yair Minsky (1028).
Open Problem Session for Yair Minsky (1040).

Thursday, May 29

8:30 - 9:00	**Breakfast (Ford common room)**
9:00 - 10:30	SERGEI GUKOV (Caltech) (1040) *Quantization via Mirror Symmetry II.*
10:30 - 11:00	**Coffee Break**
11:00 - 12:30	YAIR MINSKY (Yale University) (1040) *Curves, surfaces and hyperbolic 3-manifolds II.*
12:30 - 14:00	**Lunch Break**
14:00 - 15:00	DAVID BARAGLIA (University of Adelaide) (1040) *Higgs bundles and character varieties.*
15:00 - 15:30	BRIAN COLLIER (UIUC) (1024) *Fix points of roots of unity actions on Higgs bundle moduli space.*
	CURTIS KENT (University of Toronto) (1028) *Asymptotic cones of relatively hyperbolic groups.*
	JEAN RAIMBAULT (Max Planck Institute) (1046) *Convergence of arithmetic hyperbolic manifolds.*
15:30 - 16:00	**Coffee Break**
16:00 - 16:30	DU PEI (Caltech) (1024) *TQFT and the Geometry of Moduli Spaces.*
	JEREMY TOULISSE (University of Luxembourg) (1028) *AdS geometry and minimal Lagrangians maps.*
16:30 - 16:45	**Short Break**
16:45 - 18:00	Exercise Session for Sergei Gukov (1024). Open Problem Session for Sergei Gukov (1040).
	Exercise Session for Yair Minsky (1028). Open Problem Session for Yair Minsky (1040).

Friday, May 30

8:30 - 9:00	**Breakfast (Ford common room)**
9:00 - 10:30	RICHARD WENTWORTH (University of Maryland) (1040) *On the geometry of the moduli space of Higgs bundles I.*
10:30 - 11:00	**Coffee Break**
11:00 - 12:30	JULIEN MARCHE (Institut Mathematiques Jussieu) (1040) *SL_2-character varieties of 2 and 3-manifolds through examples I.*
12:30 - 14:00	**Lunch Break**
14:00 - 15:00	CHRISTIAN ZICKERT (University of Maryland) (1040) *Coordinates for representations of 3-manifold groups.*
15:00 - 15:30	**Coffee Break**
15:30-16:30	SARAH KOCH (University of Michigan) (1040) *Maps on moduli space in complex dynamics.*
16:30 - 16:45	**Short Break**
16:45 - 18:00	Exercise Session for Julien Marche (1024). Open Problem Session for Julien Marche (1040). Exercise Session for Richard Wentworth (1028). Open Problem Session for Richard Wentworth (1040).
19:00-21:00	**EVENING EVENT - BBQ (Island Park)**

Saturday, May 31

8:30 - 9:00	**Breakfast (Ford common room)**
9:00 - 10:30	JULIEN MARCHE (Institut Mathematiques Jussieu) (1040) *SL_2-character varieties of 2 and 3-manifolds through examples II.*
10:30 - 11:00	**Coffee Break**
11:00 - 12:30	RICHARD WENTWORTH (University of Maryland) (1040) *On the geometry of the moduli space of Higgs bundles II.*
12:30 - 14:00	**Lunch Break**
14:00 - 15:00	FLORENT SCHAFFHAUSER (Universidad de los Andes) (1040) *Representation varieties in real algebraic geometry.*
15:00 - 15:30	MAXIME BERGERON (UBC) (1024) *The topology of nilpotent representations in reductive groups and their maximal compact subgroups.*
	QIONGLING LI (Rice University) (1028) *Asymptotic Behavior of Some Rays in Hitchin Components.*
	BRAM PETRI (University of Fribourg) (1046) *The systole of a random surface.*
15:30-16:00	**Coffee Break**
16:00-16:30	JAKOB BLAAVAND (Oxford University) (1024) *A Fourier-Mukai transform for Higgs bundles.*
	FEDERICA FANONI (University of Fribourg) (1028) *Embedded disks in hyperbolic surfaces and 2-dimensional orbifolds.*
16:30 - 16:45	**Short Break**
16:45 - 18:00	Exercise Session for Julien Marche (1024). Open Problem Session for Julien Marche (1040).
	Exercise Session for Richard Wentworth (1028). Open Problem Session for Richard Wentworth (1040).

Sunday, June 1

8:30 - 9:00 **Breakfast (Ford common room)**

9:00 - 9:30 DANIELE ALESSANDRINI (University of Heidelberg) (1024)
Spectral networks and representations.

BRIAN BENSON (UIUC) (1028)
The Cheeger Constant in Hyperbolic Geometry.

9:30 - 10:00 PRIYAM PATEL (Purdue University) (1024)
Quantifying Residual Properties of Virtually Special Groups.

ANDREW YARMOLA (Boston College) (1028)
Volume of Hyperbolic n-Manifolds with Cusped Geodesic Boundary and Orthospectra.

10:00 - 10:30 MATTHEW DURHAM (UIC) (1024)
Elliptic Actions on Teichmüller Space.

SON HO (University of Maryland) (1028)
Conformally flat 3 manifolds - examples and questions.

10:30 - 11:00 **Coffee Break**

11:00-11:30 RAMIRO LAFUENTE (University of Cordoba) (1024)
Einstein and Ricci soliton homogeneous manifolds.

ARIELLE LEITNER (UCSB) (1028)
Geometric Transitions of the Cartan Subgroup in $SL(n, \mathbb{R})$.

11:30 - 12:00 SELIM GHAZOUANI (Ecole Normale Supérieure) (1024)
Branched affine structures on surfaces and their holonomy.

DMITRIY SLUTSKIY (University of Strasbourg) (1028)
Polyhedral metrics on the boundaries of convex domains in hyperbolic manifolds.

12:00 - 12:30 JULIEN KORINMAN (Institut Fourier, Grenoble) (1024)
Decomposition of quantum representations into irreducible factors.

CAGLAR UYANIK (UIUC) (1028)
Generalized north-south dynamics on the space of geodesic currents.

Mini-Courses

MARTIN BRIDGEMAN

Geodesic flows, convex Anosov representations and pressure metrics

During the course we will first overview convex Anosov representations, and then study the geodesic flow of a hyperbolic group. Afterwards we shall look at thermodynamic formalism as well as trace identities and variation of length.

DAVID DUMAS

Complex projective structures and their holonomy limits

The limits of holonomy representations of complex projective structures on a compact Riemann surface in the Morgan-Shalen compactification of the character variety are studied. We show that the dual R-trees of the quadratic differentials associated to a divergent sequence of projective structures determine the Morgan-Shalen limit points up to a natural folding operation. For quadratic differentials with simple zeros, no folding is possible and the limit of holonomy representations is isometric to the dual tree. We also derive an estimate for the growth rate of the holonomy map in terms of a norm on the space of quadratic differentials.

SERGEI GUKOV

Quantization via Mirror Symmetry

When combined with mirror symmetry, the A-model approach to quantization leads to a fairly simple and tractable problem. The most interesting part of the problem then becomes finding the mirror of the coisotropic brane. We illustrate how it can be addressed in a number of interesting examples related to representation theory and gauge theory, in which mirror geometry is naturally associated with the Langlands dual group. Hyperholomorphic sheaves and (B,B,B) branes play an important role in the B-model approach to quantization.

JULIEN MARCHE

SL_2-character varieties of 2 and 3-manifolds through examples.

We will study many examples of character varieties of surfaces and 3-manifolds groups. Along the way, we will review their algebraic properties as their symplectic structure (if any), ideal points, torsion form and boundary structures.

YAIR MINSKY

Curves, surfaces and hyperbolic 3-manifolds

What does a hyperbolic 3-manifold look like? It is often useful to probe the geometry of such a manifold by mapping surfaces into it. A fundamental example is a manifold that fibers over the circle, whose geometry is controlled in a quite explicit way by the monodromy map of the fiber. The connection between the topology of surface maps and the geometry of 3-manifolds is mediated by a combinatorial structure associated to a surface, its complex of curves. I will talk about how these ingredients fit together, explore examples and try to explain the ideas behind some of the proofs.

JOHN PARKER

Complex hyperbolic geometry and quasi-Fuchsian groups.

In this mini course I will give a brief introduction to complex hyperbolic 2-space and its group of holomorphic isometries, PU(2,1). I will then survey what is known about complex hyperbolic quasi-Fuchsian representations of surface groups (both with and without punctures). I will try to emphasise both the similarity with and the differences from the classical theory of Kleinian groups. There are many open problems in this area. I will try to indicate problems that would be good to work on.

KIM RUANE

Boundaries of CAT(0) Groups and Spaces

We will introduce the visual and Tits boundaries of a CAT(0) space and discuss the different information you get from each. In contract to the word hyperbolic setting, CAT(0) groups do not have unique boundary. We will discuss this phenomenon as well as some open problems related to this issue. We would also like to understand how the topology or each or the combination of both can provide information about the group. In particular, to what extent is there a connection between splittings of a group acting geometrically on the space and these boundaries. The mini-course will focus on analyzing lots of examples and known results related to these problems.

RICHARD WENTWORTH

On the geometry of the moduli space of Higgs bundles

This will be introductory course on moduli spaces of bundles and Higgs bundles on Riemann surfaces. It is meant to provide background material for some of the other talks at the retreat. After motivating the relationship between surface group representations and holomorphic techniques, I will discuss the basic structure of the Hitchin-Kobayashi correspondence and its relationship with symplectic reduction and geometric invariant theory. I will move on to talk about Higgs bundles and the hyperkähler geometry of the Hitchin fibration. Equivariant harmonic maps and their variational and asymptotic behavior play an important role in this story. I will outline basic results of the theory and its relationship with Teichmüller and higher Teichmüller spaces.

Senior Talks

DAVID BARAGLIA

Higgs bundles and character varieties.
Higgs bundle moduli spaces can be used to study character varieties of Riemann surfaces into complex semisimple Lie groups. There are several related character varieties that one may consider, such as representations into real Lie groups or representations of fundamental groups of non-oriented surfaces. It turns out that such character varieties can profitably be viewed as branes in Higgs bundle moduli spaces. I will show how this works generally and focus on a particular case where equivariant K-theory makes an appearance.

SUBHOJOY GUPTA

Real reflections, commutators and cross-ratios in complex hyperbolic space.
The holonomy of a complex projective structure on a closed surface S gives a representation of the surface-group to PSL(2,C). For any such representation R, consider all (marked) projective structures on S with holonomy R. I shall talk about a result (joint work with Shinpei Baba) that shows that their underlying conformal structures are dense in the Riemann moduli space of S. The proof uses grafting deformations of complex projective structures, and a previous result about their strong asymptoticity with Teichmüller geodesic rays.

SEBASTIAN HENSEL

The set of uniquely ergodic interval exchange transformations is path-connected
Interval exchange transformations (IETs) are easy to define, yet have rich and interesting dynamical properties and connections to foliations on surfaces. In this talk I will study the space of all IETs with a given permutation, and more explicitly the subset of all uniquely ergodic IETs. In joint work with Jon Chaika I proved that the set of all uniquely ergodic IETs is path-connected (unless the permutation has obvious obstructions). I will explain the proof and indicate connections to related questions about mapping class groups.

SARAH KOCH

Maps on moduli space in complex dynamics.
A postcritically finite branched cover $f : S^2 \to S^2$ induces a holomorphic endomorphism on a certain Teichmüller space, called the Thurston pullback map. In favorable cases, an "inverse" of the Thurston pullback map descends to the corresponding moduli space. We will present this construction and show how the dynamics of these moduli space maps can be used to understand the dynamics of the Thurston pullback map in the setting of Thurston's topological characterization of rational maps.

JOHANNA MANGHAS

Purely loxodromic subgroups of right-angled Artin groups
We call loxodromic those elements of a right-angled Artin group G whose centralizers are cyclic. These are exactly the elements which act as rank-one isometries on the CAT(0) space associated to G (Behrstock-Charney), or equivalently those with unbounded orbits in the ayclindrical action of G on its associated quasi-tree (the extension graph of Kim-Koberda). Many right-angled Artin groups have subgroups all of whose nontrivial elements are loxodromic, and these will be the subject of the talk.

DUC-MANH NGUYEN

Cylinder decompositions and $GL(2,\mathbb{R})$-orbit closures of genus three translation surfaces.
Using recent results by Eskin-Mirzakhani-Mohammadi and Avila-Eskin-Möller, together with techniques developed by A.Wright, we give the complete list of GL(2,R)-invariant submanifolds of dimension 4 ($GL(2,\mathbb{R})$-orbit closures) in the minimum stratum of the moduli space of genus three translation surfaces. These are joint works with David Aulicino and Alex Wright.

ANNE PARREAU

Compactification of representation spaces through length functions.

I'll explain the compactifications for character varieties $Hom(\Gamma, G)//G$ based on length functions, which generalize Thurston's compactification for Teichmüller space. Boundary points can be interpreted as length functions of actions on non-discrete buildings, which arise as asymptotic cones of symmetric spaces. In particular, it gives a natural compactification of Hitchin components. In the case where Γ is a surface group and $G = PGL(3)$, I will give a simple description of a large family of boundary points.

JULIEN PAUPERT

Real reflections, commutators and cross-ratios in complex hyperbolic space.

A real reflection in complex hyperbolic space is an antiholomorphic involution (the prototype of such a map is complex conjugation in each coordinate). We provide a concrete criterion to determine whether a 2-generator subgroup of $SU(2,1)$ is generated by real reflections. As an application we show that the Picard modular groups $SU(2,1,O_d)$ are generated by real reflections when $d = 1, 2, 3, 7, 11$. This is joint work with Pierre Will.

FLORENT SCHAFFHAUSER

Representation varieties in real algebraic geometry.

The $GL(n;C)$ representation variety associated to a compact Riemann surface X has various real structures of interest, the most immediate of which being perhaps that which fixes representations with values in $GL(n;R)$. When the Riemann surface X itself has a real structure, a new real structure of the $GL(n;C)$ representation variety arises, whose fixed points can be interpreted nicely in terms of representations of the fundamental group of X. In this introductory talk, we study in detail that example.

CHRISTIAN ZICKERT

Coordinates for representations of 3-manifold groups

We discuss the shape and Ptolemy coordinates, which are coordinates on representation varieties coming from triangulations. The coordinates are 3-dimensional analogues of coordinates on higher Teichmüller spaces due to Fock and Goncharov.

Junior Talks

DANIELE ALESSANDRINI

Spectral networks and representations.
(University of Heidelberg)
The theory of spectral networks was developed by Gaiotto, Moore and Neitzke during their research about supersymmetry. These objects have an independent interest for mathematicians, mostly in the theory of surfaces. They can be described as combinatorical objects on the surface, or, equivalently as some orbits associated to a conformal structure on the surface and a collection of holomorphic differentials. They give nice coordinates on the moduli spaces of representations of surface groups that generalise Fock-Goncharov coordinates. I will give an introduction to the theory from the point of view of representations, and discuss some developments.

BRIAN BENSON

The Cheeger Constant in Hyperbolic Geometry.
(University of Illinois at Urbana Champaign)
After I have defined and given a basic overview of the Cheeger constant, we will discuss work of Lackenby showing that the Cheeger constant of a hyperbolic 3- manifold can be used to bound the genus of the manifold from below. We will consider a procedure introduced by Brooks and Zuk for giving upper bounds for the Cheeger constant of a hyperbolic manifold. I will also describe a theoretical method for precisely computing the Cheeger constant of a hyperbolic 2-manifold. If time permits, I will describe Selberg's eigenvalue conjecture and show how to give a sanity check for this conjecture using the Cheeger constant and applying techniques outlined in the talk.

MAXIME BERGERON

The topology of nilpotent representations in reductive groups and their maximal compact subgroups.
(University of British Columbia)
I will discuss the topology of the space $Hom(N, G)$ of homomorphisms from a finitely generated group N into a reductive complex linear algebraic group G (e.g. a general linear group). When K is a maximal compact subgroup of G (e.g. the subgroup of unitary matrices), $Hom(N, K)$ is a subspace of $Hom(N, G)$. Although in general these topological spaces are quite different, I will explain why if N is nilpotent there is a strong deformation retraction of $Hom(N, G)$ onto $Hom(N, K)$. As a bi-product of the proof, we also obtain a strong deformation retraction of the character variety $Hom(N, G)//G$ onto $Hom(N, K)/K$.

JAKOB BLAVAAND

A Fourier–Mukai transform for Higgs bundles.
(University of Oxford)
In this talk we will construct a Fourier–Mukai transform for Higgs bundles, and discuss some of its key properties. We will also give an indication of why such a transform is interesting, and what we might be able to gain by considering the transform of a Higgs bundle as opposed to the Higgs bundle it self.

ANTOINE CLAIS

Combinatorial Loewner Property on boundaries of hyperbolic groups.
(University of Lille 1)
In hyperbolic geometry, the relationship between the geometry of the space and the conformal geometry of the boundary turned out to be essential since Poincaré. In the context of hyperbolic groups, quasiconformal structures on boundaries have allowed to prove rigidity results. For instance rigidity of quasi-isometries in Fuchsian buildings.

BRIAN COLLIER

Fix points of roots of unity actions on Higgs bundle moduli space.
(University of Illinois at Urbana Champaign)
For a Riemann surface Σ, the nonabelian Hodge theorem provides a homeomorphism between the moduli space of polystable Higgs bundles on Σ and the character variety of Σ. One direction of the homeomorphism is given by a Kobayashi-Hitchin correspondence relating polystable Higgs bundles to solutions of certain gauge theoretic equations which yield a special metric and a flat connection. In this talk we will examine when a holomorphic splitting of a Higgs bundle is unitary with respect to the special metric and discuss the relation these special Higgs bundles have with variations of Hodge structures.

MATTHEW DURHAM

Elliptic Actions on Teichmüller Space.
(University of Illinois at Chicago)
Kerckhoff's solution to the Nielsen realization problem showed that the action of any finite subgroup of the mapping class group on Teichmüller space has a fixed point. The set of fixed points is a totally geodesic submanifold. We study the coarse geometry of the set of points which have bounded diameter orbits in the Teichmüller metric. We show that each such almost-fixed point is within a uniformly bounded distance of the fixed point set, but that the set of almost-fixed points is not quasiconvex. In addition, the orbit of any point is shown to have a fixed barycenter. In this talk, I will discuss the machinery and ideas used in the proofs of these theorems.

FEDERICA FANONI

Embedded disks in hyperbolic surfaces and 2-dimensional orbifolds.
(University of Fribourg)
Given a hyperbolic surface, there are known sharp upper and lower bounds for the size of the biggest disk we can embed. These bounds depend only on the topology of the surface. I will present some of these results and I will discuss the same problem in the case of hyperbolic surfaces with cone singularities (two-dimensional hyperbolic orbifolds).

SER-WEI FU

Length spectral rigidity for strata of flat metrics.
(University of Illinois at Urbana Champaign)
When considering Euclidean cone metrics on a surface induced by quadratic differentials, there is a natural stratifcation by prescribing cone angles. I will describe a simple method to reconstruct the metric locally using the lengths of a finite set of closed curves. However, the main discussion will be on the surprising result that a finite set of simple closed curves cannot be length spectrally rigid when the stratum has enough complexity. This is extending a result of Duchin-Leininger-Rafi.

SELIM GHAZOUANI

Branched affine structures on surfaces and their holonomy.
(Ecole Normale Supérieure, Paris)
Branched affine structures on surfaces can be seen as generalizations of translation surfaces or as specific cases of complex projective structures. Recent works in other fields have given rise to many interesting problems which have not been explored yet. Examples of such problems include building explicit models for affine surfaces, describing the representations which are the holonomy of such structures, studying the action of the mapping class group on the character variety, or understanding dynamics of horizontal foliations in the real case.

SON HO

Conformally flat 3 manifolds - examples and questions.
(University of Maryland)
In this talk there will be examples of manifolds modeled on the 3-sphere, which is the natural boundary of hyperbolic 4-space. We will also discuss recent progress and future directions.

CURTIS KENT

Asymptotic cones of relatively hyperbolic groups.
(University of Illinois at Urbana Champaign)
An asymptotic cone is an object which captures the coarse geometric structure of a metric space. The geometry of an asymptotic cone of a group G is closely related to the algorithmic and combinatorial properties of G. Kleiner and Kapovich showed that a finitely presented group which has an asymptotic cone that is a tree is hyperbolic. We will show that this statement can be generalized to relatively hyperbolic groups. This is joint work with R. Coulon and M. Hull.

ALEKSANDR KOLPAKOV

Colourings of polytopes and hyperbolic 4-manifolds.
(Vanderbilt University)
Is it true that every orientable compact 3-manifold is a boundary of an orientable compact 4-manifold? A classical result in cobordism theory (originally by Rokhlin) says that the answer is "yes"". Later on a number of researchers reconsidered this question in the setting of manifolds having non-positive curvature (especially hyperbolic ones), motivated by a question of Misha Gromov.

Constructing hyperbolic 4-manifolds with controlled geometry (prescribed boundary components or cusp sections) is a non-trivial task. First results were delivered by Long and Reid, also Niemershiem. There are still many open problems, however. E.g., the existence of a single-cusped hyperbolic 4-manifold remained in question for about 12 years.

We shall concentrate on a recent construction of single-cusped 4-manifolds by Martelli (University of Pisa) and the speaker, as well as on a construction of hyperbolic 4- dimensional instantons with controlled geometry by Martelli (University of Pisa), Tschantz (Vanderbilt University) and the speaker.

JULIEN KORINMAN

Decomposition of quantum representations into irreducible factors.
(Institut Fourier, Grenoble)
The quantization of the moduli spaces of flat connexions over a G-bundle on a surface modulo gauge invariance, leads to projective representations of the mapping class group of surfaces. When G=U(1) or SU(2) we will present an elementary description of these representations using skein theory . We then will discuss some results concerning their decomposition into irreducible factors.

KENJI KOZAI

Hyperbolic structures from Sol.
(University of California, Berkeley)
The invariant measured foliations of a pseudo-Anosov map define a singular Euclidean metric on a surface which, along with the pseudo-Anosov flow, define a singular Sol structure on the mapping torus. We show that if the pseudo-Anosov also has orientable foliations and 1 is not an eigenvalue of the induced cohomology action, then there are action of the mapping class group on the character variety, or understanding dynamics of horizontal foliations in the real case.

RAMIRO LAFUENTE

Einstein and Ricci soliton homogeneous manifolds.
(Universidad Nacional de Cordoba)
A Riemannian manifold is called Einstein if it has constant Ricci curvature. In the non-compact homogeneous case, a long-standing conjecture states that they must be all diffeomorphic to a Euclidean space R^n. In this talk we present the first general structure theorem for such metrics, showing a close interplay between the algebraic and geometric data. As an application, we prove that the conjecture is actually equivalent to the a priori much stronger analogous statement for Ricci soliton metrics. Our main tools come from Geometric Invariant Theory, making use of a natural action of the real reductive group $GL_n(R)$ on the moduli space of all homogeneous metrics on the manifold, which is modelled on an algebraic variety. This is a joint work with J. Lauret.

ARIELLE LEITNER

Geometric Transitions of the Cartan Subgroup in SL(n,R).
(University of California, Santa Barbara)
We study the possible limits of the Cartan subgroup in SL(n,R). A limit group is the limit under a sequence of conjugations of the diagonal Cartan subgroup. In SL(3,R), there are 5 possible limit groups up to conjugacy, each determined by an equivalence class of degenerate triangle. We will discuss some ideas for approaching the general problem using nonstandard analysis.

QIONGLING LI

Asymptotic Behavior of Some Rays in Hitchin Components.
(Rice University)
In this talk, I will first go through Higgs bundles, basic construction of Hitchin components inside the moduli space of Higgs bundles. I will then introduce recent work with Brian Collier on asymptotic behaviors of some rays in Hitchin components. Namely, consider the family of Higgs bundles $(E, t\phi)$, we try to analyze the asymptotic behavior of the corresponding representation ρ_t as t tends to raAgsinfty in two special cases.

ANTON LUKYANENKO

Heisenberg geometry and quasi-conformal mappings.
(University of Illinois at Urbana Champaign))
The boundary of complex hyperbolic space is the Heisenberg group, and quasi- isometries of complex hyperbolic space turn into quasi-conformal mappings of its boundary. The natural geometry of the Heisenberg group is not Riemannian and therefore a bit counter-intuitive. I will use pictures and props to illustrate this geometry and some of the intricacies one runs into when studying its quasi-conformal theory.

PRIYAM PATEL

Quantifying Residual Properties of Virtually Special Groups.
(Purdue University)
In this talk we discuss some of the residual properties of right-angled Artin groups (raAgs) and define what is means to quantify such properties. We then describe the techniques used to quantify residual properties of raAgs and how the results extend to virtually special groups. This work is joint with Khalid Bou-Rabee and Mark Hagen.

DU PEI

TQFT and the Geometry of Moduli Spaces.
(Caltech)
Many interesting quantities associated with moduli spaces can be naturally viewed as partition functions of Topological Quantum Field Theories (TQFT's). In this talk, after reviewing the basics of TQFT, we will focus on Yang-Mills theory in two dimensions and relate its partition function to the symplectic volume of the moduli space of flat connections.

ANA PEON-NIETO

Higgs bundles and cameral covers.
(University of Heidelberg)
Let G^c be a complex reductive Lie group. Hitchin proved that the moduli space of G^c-Higgs bundles over a smooth projective curve admits a canonical morphism, called the Hitchin map, to an affine scheme (the Hitchin base) turning it into an integrable system. In later work, Donagi and Gaitsgory showed that, in the case of algebraic groups, the Hitchin system yields an abelian gerbe over the Hitchin base. They identify the fibers to be categories of torsors (with structure group a maximal torus of G^c) over the so called cameral cover, which generalises Hitchin's spectral cover. I will explain how their results extend to the moduli stack of G-Higgs bundles, where G is a real form of a semisimple algebraic group and I will analyse some examples.

BRAM PETRI

The systole of a random surface.

(University of Fribourg)

A random surface is a surface that is obtained by randomly gluing together an even number of triangles. There is a natural way to endow these surfaces with a hyperbolic structure. By a theorem of Belyi, the set of surfaces obtained by this procedure is dense in any moduli space. So, in a sense, random surfaces are 'typical' hyperbolic surfaces. Furthermore, there is a connection between random surfaces and random trivalent graphs. In this talk I will explain how this can be used to compute the expected length of the shortest non-contractible curve (the systole) on a random surface.

YULAN QING

Roller Boundary of CAT(0) Cube Complex.

(Technion-Israel Institute of Technology)

In this study we build a map between the Roller boundary and the ideal boundary, for any given rank-1, finite-dimensional, cocompact CAT(0) cube complex. By rank-1 we mean that there exists rank-1 isometries in the group that acts cocompactly on the space. One motivation for our study is that Roller boundary of CAT(0) cube complexes is shown to have nice dynamic properties by Nevo and Sageev.

JEAN RAIMBAULT

Convergence of arithmetic hyperbolic manifolds.

(Max Planck Institute for Mathematics)

The aim of the proposed talk is to motivate the notion of Benjamin–Schema convergence for hyperbolic manifolds (introduced by Abért–Bergeron–Bringer– Gelander–Nikolov–Raimbault–Samet) by showing its versatility. More precisely, we would show that for many sequences of manifolds having arithmetic origin such a convergence takes place.

DMITRIY SLUTSKIY

Polyhedral metrics on the boundaries of convex domains in hyperbolic manifolds.

(University of Strasbourg)

We show the existence of a quasi-Fuchsian manifold which contains a convex compact domain such that the induced metric on its boundary coincides with a prescribed hyperbolic polyhedral metric.

MARCO SPINACI

Deformations of twisted harmonic maps.

(Institut Fourier, Grenoble)

We propose a study of the infinitesimal properties of the Hitchin energy functional via deformations of twisted harmonic maps up to the second order. We generalize several results (due to Hitchin in the Riemann surface case) to higher dimensional Kähler manifolds; namely, the identification between critical points of the energy functional and polarised variations of Hodge structures, the strict plurisubharmonicity of the energy functional and the formula relating its Morse indices with eigenvalues of the infinitesimal generator of the S^1-action.

KRZYSZTOF SWIECICKI

Helly's theorem for systolic complexes.

(Texas A&M University)

Systolic complexes are connected, simply connected simplicial complexes satisfying some additional local combinatorial condition, which is a simplicial analogue of nonpositive curvature. Systolic complexes inherit lots of CAT(0)-like properties, however being systolic neither implies, nor is implied by nonpositive curvature of the complex equipped with the standard piecewise euclidean metric. There is a well known generalization of classical Helly's theorem for CAT(0) cube complexes, which inspired our study of the same phenomena for systolic complexes. In this talk I will introduce the systolic complexes and the Helly's dimension of the geodesic metric space, afterward I will present the Helly's theorem for systolic complexes.

SAM TAYLOR

Convex cocompactness and stability in mapping class groups.
(University of Texas at Austin)
Convex cocompact subgroups of mapping class groups were introduced by Farb and Mosher and have important connections to the geometry of Teichmüller space, the curve complex, and surface group extensions. In this talk, I will discuss a new characterization of such subgroups that involves only the geometry of the mapping class group. This characterization involves a strong notion of quasiconvexity, which we call stability, and captures the intuition that convex cocompact subgroups are "highly hyperbolic" subgroups of mapping class groups. This is joint work with Matt Durham.

JEREMY TOULISSE

AdS geometry and minimal Lagrangians maps.
(University of Luxembourg)
In the early 90's, G. Mess discovered deep relations between Anti-de Sitter (AdS) geometry and Teichmüller theory. In particular, there exists a link between minimal Lagrangian maps and maximal surfaces in AdS manifolds. We will explain this link, extend it to the case of manifolds with conical singularities and prove the existence of a unique minimal Lagrangian diffeomorphism between hyperbolic surfaces with cone singularities.

CAGLAR UYANIK

Generalized north-south dynamics on the space of geodesic currents.
(University of Strasbourg)
The study of outer automorphism group of a free group $Out(F_N)$ is closely related to study of Mapping Class Groups. The $Out(F_N)$ analog of a pseudo-Anosov homeomorphism is called a fully irreducible or iwip (short for irreducible with irreducible powers). We will talk about types of iwips, geometric and hyperbolic, and prove that an iwip ϕ acts on the space of geodesic currents with some sort of north-south dynamics. As an application, we will give a criterion for subgroups of $Out(F_N)$ to contain a hyperbolic iwip.

NICHOLAS G. VLAMIS

Quasiconformal Homogeneity, mapping class groups, and a counting problem in Teichmüller space.
(Boston College)
We will recall the definition of a quasiconformally homogeneous hyperbolic manifold and a two part classification theorem for such manifolds in dimension $n \geq 3$. Our focus will be in dimension two, where a lack of rigidity forces one part of this classification to fail; we investigate the second part, which looks for a lower bound of the quasiconformal homogeneity constant associated to a hyperbolic surface. We will discuss progress in this problem as well as a path forward by looking at a counting problem in Teichmüller space.

RICHARD WEBB

Effective Masur–Minsky Theory.
(University of Warwick)
A main ingredient of the Ending Lamination Theorem is the classification of Kleinian surface groups - this is done in papers of Minsky, and Brock, Canary and Minsky. Key to the proof is the use of hierarchies of tight geodesics, developed by Masur and Minsky. Briefly put, a hierarchy is something that breaks an object into an organized or ordered collection of pieces, which you then study piece by piece. In terms of the underlying surface we shall describe how 'efficient' hierarchies are, by effectivizing Masur and Minsky's original results. From here, one can pursue effectivizing theorems in hyperbolic geometry, such as Brock's theorem on volumes of convex cores of quasi- Fuchsian manifolds, as well as theorems concerning mapping class groups. Joint work with Tarik Aougab and Samuel Taylor.

ANDREW YARMOLA

Volume of Hyperbolic n-Manifolds with Cusped Geodesic Boundary and Orthospectra.

(Boston College)

Let M be a finite volume hyperbolic n-manifold with non-empty totally geodesic boundary. When the boundary of M is cusp free, Bridgeman and Kahn show that the volume of M is equal to the sum of the values of a function F_n on the orthospecturm of M. In this talk, we describe how to extend their identity to the case where the boundary of M has cusps for all n.

TENGREN ZHANG

Degeneration of Convex RP^2 structures on surfaces.

(University of Michigan)

Let S be a closed orientable surface of negative Euler characteristic, and let $C(S)$ be the deformation space of convex real projective structures on S. I will present new results about how some of the geometric properties of the convex projective structure degenerate as one deforms the structure along the internal parameters of the Goldman parameterization of $C(S)$. If time permits, I will talk about generalizations of this result to the $PSL(n, R)$-Hitchin component.

ANDREW ZIMMER

Rigidity of convex divisible sets

(University of Michigan)

An open convex set in real projective space is called divisible if there exists a discrete group of projective automorphisms which acts co-compactly. The classic example of a divisible set is the unit ball, this has projective automorphism group PSO(1,d) and hence by a theorem of Borel there exists a discrete group which acts co-compactly. There are many additional examples of such sets and a theorem of Benoist implies that many of these examples are strictly convex, have C^1 boundary, and have word hyperbolic dividing group. In this talk I will discuss a notion of convexity in complex and quaternionic projective space and show that every divisible "convex" set with C^1 boundary is projectively equivalent to the unit ball. The proof uses an analogue of the Hilbert metric and tools from dynamics, geometric group theory, and algebraic groups.

List of Participants

Participants

1 .	Christopher Abram	Arizona State University
2 .	Jorge Acosta	Rice University
3 .	Vincent Alberge	University of Strasbourg
4 .	Daniele Alessandrini	University of Heidelberg
5 .	Dylan Allegretti	Yale University
6 .	Yahya Almalki	Florida State University
7 .	Fabián Arias	Universidad de los Andes
8 .	Shinpei Baba	California Institute of Technology
9 .	David Baraglia	University of Adelaide
10 .	Brian Benson	University of Illinois
11 .	Maxime Bergeron	University of British Columbia
12 .	Edgar Bering	University of Illinois at Chicago
13 .	Jakob Blaavand	University of Oxford
14 .	Steve Bradlow	University of Illinois at Urbana-Champaign
15 .	Martin Bridgeman	Boston College
16 .	Jean-Philippe Burelle	University of Maryland
17 .	Richard Canary	University of Michigan
18 .	Duván Cardona	Universidad de los Andes
19 .	Saikat Chatterjee	Institut des Hautes Études Scientifiques
20 .	Edward Chien	Rutgers - New Brunswick
21 .	Antoine Clais	University of Lille1
22 .	Neal Coleman	Indiana University
23 .	Brian Collier	University of Illinois at Urbana-Champaign
24 .	Nelson Colon	University of Iowa
25 .	Ellie Dannenberg	University of Illinois at Chicago
26 .	Kajal Das	Ecole Normale Superieure Lyon / Paris Sud 11
27 .	Saikat Das	Rutgers - Newark
28 .	Artur de Araujo	University of Porto
29 .	Spencer Dowdall	University of Illinois at Urbana-Champaign
30 .	Benjamin Dozier	Stanford University
31 .	David Dumas	University of Illinois at Chicago
32 .	Yen Duong	University of Illinois at Chicago
33 .	Matthew Durham	University of Illinois at Chicago
34 .	Viveka Erlandsson	Aalto University
35 .	Federica Fanoni	University of Fribourg
36 .	Aaron Fenyes	University of Texas at Austin
37 .	Laura Fredrickson	University of Texas at Austin
38 .	Ser-Wei Fu	University of Illinois at Urbana-Champaign
39 .	Lindsey Gamard	Arizona State University
40 .	Jonah Gaster	University of Illinois at Chicago
41 .	Selim Ghazouani	Ecole Normale Supérieure, Paris
42 .	Sourav Ghosh	University of Paris Sud 11
43 .	Jordane Granier	Université Joseph Fourier, Grenoble
44 .	Ryan Greene	Ohio State University
45 .	Clément Guérin	University of Strasbourg
46 .	Sergei Gukov	Caltech

PARTICIPANTS

47 .	Funda Gultepe	University of Illinois at Urbana-Champaign
48 .	Subhojoy Gupta	Caltech
49 .	Rosemary Guzman	University of Iowa
50 .	Mustafa Hajij	Louisiana State University
51 .	Oskar Hamlet	Gothenburg University
52 .	Sebastian Hensel	University of Chicago
53 .	Son Ho	University of Maryland
54 .	Andy Huang	Rice University
55 .	Gahye Jeong	California Institute of Technology
56 .	Lizhen Ji	University of Michigan
57 .	Lien-Yung Kao	University of Notre Dame
58 .	Curtis Kent	University of Toronto
59 .	Steve Kerckhoff	Stanford University
60 .	Muhammad Ali Khan	University of Porto
61 .	Semin Kim	Brown University
62 .	Thomas Koberda	Yale University
63 .	Sarah Koch	University of Michigan
64 .	Aleksandr Kolpakov	Vanderbilt University
65 .	Julien Korinman	Institut Fourier, Grenoble
66 .	Kenji Kozai	University of California, Berkeley
67 .	Georgios Kydonakis	University of Illinois at Urbana-Champaign
68 .	Ramiro Lafuente	Universidad Nacional de Cordoba
69 .	Michael Landry	Yale University
70 .	John Lawson	Durham University
71 .	Christine Lee	Michigan State University
72 .	Gye-Seon Lee	University of Heidelberg
73 .	Michelle Lee	University of Maryland
74 .	Arielle Leitner	University of California, Santa Barbara
75 .	Ivan Levcovitz	CUNY Graduate Center
76 .	Qiongling Li	Rice University
77 .	Benjamin Linowitz	University of Michigan
78 .	John Loftin	Rutgers - Newark
79 .	Brice Loustau	University of Paris Sud 11
80 .	Joel Louwsma	The University of Oklahoma
81 .	Anton Lukyanenko	University of Illinois at Urbana-Champaign
82 .	Tianyu Ma	University of Maryland
83 .	François Malabre	Universitat Autonoma de Barcelona
84 .	Sara Maloni	Brown University
85 .	Johanna Mangahas	Brown University
86 .	Kathryn Mann	University of Chicago
87 .	Julien Marche	Institut de mathématiques de Jussieu
88 .	Stéphane Marseglia	University of Strasbourg
89 .	Justin Martel	University of Toronto
90 .	Simone Marzioni	Aarhus University, QGM
91 .	Pere Menal-Ferrer	Georgia Tech
92 .	Yair Minsky	Yale University
93 .	Babak Modami	University of Illinois at Urbana-Champaign

PARTICIPANTS

94 . Thang Nguyen	Indiana University
95 . Duc-Manh Nguyen	Bordeaux
96 . Abdul Rauf Nizami	University of Education, Lahore
97 . Azizeh Nozad	University of Porto
98 . Frederic Palesi	Aix-Marseille Universite
99 . John Parker	Durham University
100 . Anne Parreau	Institut Fourier, Grenoble
101 . Priyam Patel	Purdue University
102 . Julien Paupert	Arizona State University
103 . Du Pei	Caltech
104 . Ana Peon-Nieto	University of Heidelberg
105 . Bram Petri	University of Fribourg
105 . Yulan Qing	Technion-Israel Institute of Technology
106 . Jean Raimbault	Max Planck Institute for Mathematics
107 . Huygens C. Ravelomanana	Universite du Quebec A Montreal
108 . David Renardy	University of Michigan
109 . Doreen Reuchsel	Brown University
110 . David Reynoso Valle	University of Maryland
111 . Russell Ricks	University of Michigan
112 . Clara Rossi Salvemini	University of Paris Sud 11
113 . Kim Ruane	Tufts University
114 . Jordan Sahattchieve	University of Michigan
115 . Andrew Sanders	University of Illinois at Chicago
116 . Ramanujan Santharoubane	Institut de mathématiques de Jussieu
117 . Florent Schaffhauser	Universidad de los Andes
118 . Laura Schaposnik	University of Illinois at Urbana-Champaign
119 . Anna-Sofie Schilling	University of Heidelberg
120 . Dmitriy Slutskiy	University of Strasbourg
121 . Yitzchak (Isaac) Solomon	Brown University
122 . Marco Spinaci	Institut Fourier, Grenoble
123 . Zhe Sun	University Paris-Sud 11
124 . Krzysztof Swiecicki	Texas A&M University
125 . Sam Taylor	University of Texas at Austin
126 . Nicolas Tholozan	University of Nice-Sophia Antipolis
127 . Jérémy Toulisse	University of Luxembourg
128 . Anh Tran	The Ohio State University
129 . Nicolaus Treib	University of Heidelberg
130 . Weston Ungemach	University of Chicago
131 . Caglar Uyanik	University of Illinois at Urbana-Champaign
132 . Nicholas Vlamis	Boston College
133 . Yohsuke Watanabe	University of Utah
134 . Richard Webb	University of Warwick
135 . Joseph Wells	Arizona State University
136 . Daping Weng	Yale University
137 . Richard Wentworth	University of Maryland
138 . Jonathan Wilson	Durham University

PARTICIPANTS

139 .	Grace Work	University of Illinois at Urbana-Champaign
140 .	Binbin Xu	Institut Fourier, Grenoble
141 .	Tian Yang	Stanford University
142 .	Andrew Yarmola	Boston College
143 .	Ren Yi	Brown University
144 .	Tengren Zhang	University of Michigan
145 .	Christian Zickert	University of Maryland
146 .	Andrew Zimmer	University of Michigan

Michelle, Sara, Andy and Laura would like to thank:

- *Steve Bradlow and Bill Goldman* for their patient and helpful advice whilst organising the meeting.
- *Linette Berry, Rhyneta Gumbs, Molly Long* for all their work;
- *Richard Canary, Ben Linowitz, Tengren Zhang* for their help in the local organisation;
- *Martin Bridgeman, David Dumas, Sergei Gukov, Julien Marché, Yair Minsky, John Parker, Kim Ruane, Richard Wentworth* for their efforts in preparing wonderful minicourses, and answering our million of requests;
- *David Baraglia, Subhojoy Gupta, Sebastian Hensel, Sarah Koch, Johanna Mangahas Kutluhan, Duc-Manh Nguyen, Anne Parreau, Julien Paupert, Florent Schaffhauser, Christian Zickert*, and all the *Junior speakers* for accepting to speak at the retreat;
- *Antoine Clais, Brian Collier, Laura Fredrickson, Selim Ghazouani, Jordane Granier, Qiongling Li, Ramanujan Santharoubane, Andrew Yarmola* helping as "note-takers" during the meeting.

GEAR Junior Retreat

University of Michigan at Ann Arbor, 23 May - 1 June 2014

http://www.math.uiuc.edu/~schaposn/Junior_Retreat.html

Mini-Courses

* Martin Bridgeman (Boston College) on Geodesic flows, convex Anosov representations and pressure metrics.
* David Dumas (UIC) on complex projective structures and their holonomy limits.
* Sergei Gukov (CalTech) on Geometry and physics of Higgs bundles and branes.
* Julien Marché (Jussieu) on Representation spaces, Chern-Simons theory, and TQFTs.
* Yair Minsky (Yale) on Recent advances in Kleinian group theory.
* John Parker (Durham) on complex hyperbolic geometry and quasi-Fuchsian groups.
* Kim Ruane (Tufts) on Boundaries of CAT(0) spaces.
* Richard Wentworth (Maryland) on The geometry of the moduli space of Higgs bundles.

Organizers

Dick Canary
Steve Kerckhoff
Michelle Lee
Ben Linowitz
Sara Maloni
Andy Sanders
Laura Schaposnik
Anna Wienhard

Senior Speakers

* David Baraglia (Adelaide)
* Subhojoy Gupta (Yale)
* Sebastian Hensel (Chicago)
* Sarah Koch (Michigan)
* Johanna Mangahas (Brown)
* Duc-Manh Nguyen (Université Bordeaux 1)
* Anne Parreau (Institut Fourier)
* Julien Paupert (Arizona State)
* Florent Schaffhauser (UniAndes)
* Christian Zickert (Maryland)

GEAR Executive Committee

Steven Bradlow
William Goldman
Steve Kerckhoff
Richard Wentworth
Anna Wienhard

GEAR is an NSF funded network of mathematicians working on GEometric structures And Representation varieties. The meeting is mainly aimed at PhD students and recent post-docs. There will be 8 mini-courses in the following themes:

1. Dynamics on Moduli Spaces
2. Geometric and Analytical Group Theory
3. Geometric Structures and Teichmüller Spaces
4. Higgs Bundles
5. Hyperbolic manifolds

Each mini-course will have an exercise session, as well as an open problems hour. Experts in the field shall present new developments in each area, and there will be short talks by young researchers. For more information about GEAR go to http://gear.math.illinois.edu/.

Registration and Funding

Funding will preferentially go to GEAR members and graduate students/postdocs at GEAR nodes; excess resources may be available for other participants. Applications received by February 1st are guaranteed full consideration, although applications will be accepted after this target date.