Complex Geometry and Related Fields
Géométrie complexe et domaines reliés
(Org: **Tatyana Barron** (Western) and/et **Eric Schippers** (Manitoba))

NADYA ASKARIPOUR, Inst. Henri Poincare
Poincare series map on open Riemann surfaces

Poincare series is a classic technique to construct automorphic forms. Let R to be a Riemann surface and $k > 1$ is an integer . Poincare series produces a linear and bounded operator from $A^{(1)}(\Delta)$ (which is the space of holomorphic and integrable k-differentials on the unit disc) onto $A^{(1)}(R)$ (which is the space of holomorphic and integrable k-differentials on R). I will talk about some applications of Poincare series on Riemann surfaces. Also I will talk about the kernel of Poincaré series map, specially I will talk about some results in this direction, obtained with T. Barron.

AJNEET DHILLON, Western University
Vector bundles with parabolic structure and algebraic stacks

I will discuss some theorems due to Indranil Biswas and Niels Borne and how they can be applied to study coherent sheaf cohomology of semistable parabolic vector bundles on algebraic curves.

BRUCE GILLIGAN, University of Regina
Holomorphic Reductions of Pseudoconvex Homogeneous Manifolds

Let G be a connected complex Lie group and H a closed complex subgroup. There is a Lie theoretic fibration $\pi : G/H \to G/J$ with G/J holomorphically separable and $\mathcal{O}(G/H) \simeq \pi^*\mathcal{O}(G/J)$ called the holomorphic reduction of the complex homogeneous manifold G/H. In general, G/J is not Stein, e.g., $\mathbb{C}^n\setminus\{0\}$ for $n > 1$, and examples show that one need not have $\mathcal{O}(J/H) \simeq \mathbb{C}$.

We will prove that if G/H is pseudoconvex and G is reductive, then
1.) the base G/J of its holomorphic reduction is Stein and $\mathcal{O}(J/H) \simeq \mathbb{C}$, and
2.) if additionally, G/H is Kähler with $\mathcal{O}(G/H) \simeq \mathbb{C}$, then $G/\overline{H}$ is a flag manifold, $\overline{H}/H$ is a Cousin group and $G/H = G/\overline{H} \times \overline{H}/H$ is a product, where $\overline{H}$ denotes the Zariski closure of H in G.
The proof employs ideas of Hirschowitz (1975) in order to show the existence of a certain foliation of non-Stein pseudoconvex domains spread over complex homogeneous manifolds. This generalizes results of Kim-Levenberg-Yamaguchi (2011).
(Based on joint work with Christian Miebach and Karl Oeljeklaus.)

GORDON HEIER, University of Houston
On uniformly effective birationality and the Shafarevich Conjecture over curves

We will discuss the following recent effective boundedness result for the Shafarevich Conjecture over function fields. Let B be a smooth projective curve of genus g, and $S \subset B$ be a finite subset of cardinality s. There exists an effective upper bound on the number of deformation types of admissible families of canonically polarized manifolds of dimension n with canonical volume v over B with prescribed degeneracy locus S. The effective bound only depends on the invariants g, s, n and v. The key new ingredient which allows for this kind of result is a careful study of effective birationality for families of canonically polarized manifolds. This is joint work with S. Takayama.

OLEG IVRII, Harvard University
Ghosts of the Mapping Class Group

Recently, McMullen showed that the Weil-Petersson metric in Teichmuller theory arises as the double derivative of the Hausdorff dimension of certain families of quasi-circles arising from simultaneous uniformization. He noticed that a similar construction can be carried out on spaces of Blaschke products; and so by analogy one can define a Weil-Petersson metric there. But how does this metric look like? Is it incomplete? Invariant under the mapping class group?

While it appears that there is no genuine mapping class group acting on the space of Blaschke products, there are 'ghosts' acting on two very different boundaries that arise from non-tangential and horocyclic degenerations. In this talk, we will describe these boundaries and illuminate these ghosts.

ALEXEY KOKOTOV, Concordia University
Polyhedral surfaces and determinant of Laplacian

The zeta-regularized determinant of the Laplacian on a compact polyhedral surface (a closed orientable surface of genus g glued from Euclidean triangles) is studied. We derive a formula for the ratio of two determinants corresponding to two conformally equivalent polyhedra (an analog of classical Polyakov's formula for two conformally equivalent smooth metrics). This formula implies the reciprocity law for polyhedra which is closely related to the classical Weil reciprocity law for harmonic functions with logarithmic singularities.

DAVID MINDA, University of Cincinnati
Hyperbolic geometry and conformal invariants.

The goal is to use classical hyperbolic geometry to obtain results about the Euclidean size of the image of a set in a simply connected hyperbolic region under a conformal mapping onto the open unit disk. The idea is to use a conformal invariant to estimate the Euclidean size. In hyperbolic geometry a half-plane H subtends an angle 2t at a point z not in H. The angle decreases as the distance from z to H increases and the angle is a conformal invariant. The classical Angle of Parallelism formula is the main tool to estimate the Euclidean size. This is joint work with A.F. Beardon.

ERIC SCHIPPERS, University of Manitoba
A refined Teichmuller space of bordered surfaces

Consider a Riemann surface biholomorphic to a compact Riemann surface of genus g with n discs removed. By classical results of Bers, the Teichmuller space of surfaces of this type is an open subset of a Banach space. In previous work David Radnell and I showed that the Teichmuller space of a bordered surface can be identified (up to a properly discontinuous group action) with a moduli space of Riemann surfaces which appears in conformal field theory, and originates with Friedan and Shenker, Vafa, and Segal.

We define a refinement of the Teichmuller space of a bordered surface, and prove that this refinement is a Hilbert manifold. This is achieved by combining the above results with work of Takhtajan and Teo on a refinement of the universal Teichmuller space. Joint work with David Radnell (American University of Sharjah) and Wolfgang Staubach (Uppsala University).

VASILISA SHRAMCHENKO, University of Sherbrooke
Higher genus Weierstrass sigma-function

We propose a new way to generalize the Weierstrass sigma-function to higher genus Riemann surfaces. Our definition of the odd higher genus sigma-function is based on a generalization of the classical representation of the elliptic sigma-function via Jacobi theta-function.

The odd higher genus sigma-function is associated with an odd spin line bundle on a given Riemann surface. We also define an even sigma-function corresponding to an arbitrary even spin structure on the surface. The proposed generalization of the sigma-function differs essentially from the existing ones; our way of generalization applies to any Riemann surface and naturally continues the approach of Felix Klein who generalized the sigma-function to the class of hyperelliptic curves.

KEN STEPHENSON, University of Tennessee
Quasiconformal Mappings via Circle Packing: a Conjecture

Suppose K is a triangulation of a region G in the plane. Associated with K is a maximal packing P in the unit disc $\mathbb{D}$, that is, a configuration of circles with the tangency pattern encoded in K. In particular, P gives an embedding K' of K in $\mathbb{D}$. Intensive experiments suggest that when K is an appropriately random triangulation of G, then the piecewise affine map $f : K' \to K$ approximates the conformal map from $\mathbb{D}$ to G. If this is the case, then by biasing the random triangulation K using the ellipse field for a Beltrami coefficient μ, one should be able to approximate the quasiconformal mapping from $\mathbb{D}$ to G with dilatation μ. Conjectured results will be illuminated by visual experiments.