Conference Schedule

Saturday, August 23

9:00am **John Milnor** (Stony Brook University)
Hyperbolic Component Boundaries

9:50am *Break with tea/coffee*

10:15am **John Hubbard** (Cornell University & Université Aix-Marseille)
Parabolic blowups in holomorphic dynamics and hyperbolic geometry

11:15am **Thomas Sharland** (Stony Brook University)
Matings of cubic polynomials with a fixed critical point

12:05pm *Lunch*

1:45pm **Poster Session**

2:30pm **Adam Epstein** (Univeristy of Warwick)
Limits of degenerate parabolic quadratic shared matings

3:20pm *Break with tea/coffee*

3:45pm **Nikita Selinger** (Stony Brook University)
Classification of Thurston maps with parabolic orbifolds

4:45pm **Mitsuhiro Shishikura** (Kyoto University)
Tropical Complex Dynamics

7:00pm *Banquet*

Sunday, August 24

9:00am **John-Erik Fornæss** (NTNU Trondheim)
The real part of complex dynamics

9:50am *Break with tea/coffee*

10:15am **Hiroyuki Inou** (Kyoto University)
Wiggles in the anti-holomorphic quadratic family

11:15am **Eric Bedford** (Indiana University & Stony Brook University)
Automorphisms of blowups of projective space

12:05pm *Lunch/Afternoon free*

Monday, August 25

9:00am **Sebastian van Strien** (Imperial College London)
Quasisymmetric rigidity and applications

9:50am *Break with tea/coffee*

10:15am **Roman Dujardin** (Université Paris Est Marne La Valée)
The dynamical Manin-Mumford problem for polynomial automorphisms of $\mathbb{C}^2$

11:15am **Sarah Koch** (University of Michigan)
Exploring the parameter space of an IFS

12:05pm *Lunch*

1:45pm Poster Session

2:30pm **John Smillie** (Cornell University & Univeristy of Warwick)
The complex Hénon family

3:20pm *Break with tea/coffee*

3:45pm **Kyounghee Kim** (Florida State University)
Pseudo-automorphisms with invariant elliptic curves

4:45pm **Jeremy Kahn** (City University of New York, Graduate Center)
Elephants and Renormalization

Tuesday, August 26

9:00am **Pascale Roesch** (Université Aix-Marseille)
Herman's condition and critical points on the boundary of Siegel disks of polynomials with two critical values

9:50am *Break with tea/coffee*

10:15am **Han Peters** (University of Amsterdam)
Polynomial skew products with wandering Fatou disks

11:15am **Misha Lyubich** (Stony Brook University)
Dynamics of dissipative polynomial automorphisms of $\mathbb{C}^2$

Abstracts of Lectures
listed alphabetically by speaker

Eric Bedford: *Automorphisms of blowups of projective space*

Sunday, August 24. 11:15am

We will discuss the existence of automorphisms and pseudo-automorphisms of complex manifolds which have positive entropy.

Roman Dujardin: *The dynamical Manin-Mumford problem for polynomial automorphisms of $\mathbb{C}^2$*

Monday, August 25. 10:15am

The dynamical Manin-Mumford problem aims at understanding under which conditions an algebraic dynamical systems can have "unusually many" periodic points on a subvariety. This is motivated by classical questions in arithmetic geometry. In this talk, I will discuss this problem in the setting of polynomial automorphisms of $\mathbb{C}^2$. This is joint work with Charles Favre (École Polytechnique).

Adam Epstein: *Limits of degenerate parabolic quadratic shared matings*

Saturday, August 23. 2:30pm

Joint work with Jean Écalle and Xavier Buff

John Hubbard: *Parabolic blowups in holomorphic dynamics and hyperbolic geometry*

Saturday, August 23. 10:15am

Kleinian groups with parabolic elements, and rational functions with parabolic cycles, are tremendoulsy unstable.

Their neighborhoods in the space of Kleinian groups (for the Chabauty topology) or in the "space of dynamical systems" is very complicated.

But not completely incomprehensible; these neighborhoods have non-trivial cohomology only in finitely many dimensions, and in some cases this cohomology can be computed.

I will try to explain how this can be done.

John-Erik Fornæss: *The real part of complex dynamics*

Sunday, August 24. 9:00am

We discuss how to reconstruct features of the dynamics of complex polynomials in one variable from knowledge of the shadow of the orbits on the real axis. This is joint work with Han Peters.

Hiroyuki Inou: *Wiggles in the anti-holomorphic quadratic family*

Sunday, August 24. 10:15am

We discuss wiggly features of "umbilical cords" and external rays in the family of the anti-holomorphic quadratic family. Hubbard and Schleicher proved the "umbilical cords" for hyperbolic components of odd period do not converge to a point under some assumption on non-renormalizability. We apply their technique to other umbilical cords and external rays.

Jeremy Kahn: *Elephants and Renormalization*

Monday, August 25. 4:45pm

I will consider the problem of finding bounds for renormalization where the parameter comes a sequence of small Mandelbrot sets that occupy the same place in the "elephants" that are marching out of the cusp of the central cardioid. I will describe my work with Mikhail Lyubich on the case where the period of the renormalization is a constant plus the period of the limb, and then briefly outline our proposed approach to the more general case.

Kyounghee Kim: *Pseudo-automorphisms with invariant elliptic curves*

Monday, August 25. 3:45pm

We will discuss an explicit method for constructing pseudo-automorphisms of a space X obtained by blowing up points of $\mathbb{P}^k$ (or a product $\mathbb{P}^k \times \cdots \times \mathbb{P}^k$). The centers of blowup are chosen to lie on an elliptic normal curve and are determined using the arithmetic on the curve. These pseudo-automorphisms have dynamical degree greater than 1. We will also discuss symmetric bilinear forms which are preserved by these pseudo-automorphisms.

Sarah Koch: *Exploring the parameter space of an IFS*

Monday, August 25. 11:15am

In 1985, M. Barnsley and A. Harrington initiated a study of the iterated function system $f_c, g_c \colon \mathbb{C} \to \mathbb{C}$ given by $\{f_c \colon z \mapsto cz + 1, g_c \colon z \mapsto cz - 1\}$, where $c \in \mathbb{D} - \{0\}$. For a given value of the parameter c, there is a nonempty attractor in the dynamical plane. A natural subset to consider in parameter space is the corresponding connectedness locus, which we (suggestively) denote as M; it has been studied by several mathematicians, including T. Bousch, who proved that it is both connected and locally connected. In 2002, C. Bandt proved that the complement of M has at least two connected components; that is, M is **not** full as a subset of $\mathbb{D} - \{0\}$.

In this talk, we explore more of the topology of M, proving that there are *infinitely many* components of the complement, and we prove that the interior of M is dense away from the real axis, establishing a conjecture of Bandt. We compare/contrast the discussion of this parameter space to the study of the parameter space for quadratic polynomials $p_c \colon z \mapsto z^2 + c$. This is joint work with D. Calegari and A. Walker.

Misha Lyubich: *Dynamics of dissipative polynomial automorphisms of $\mathbb{C}^2$*

Tuesday, August 26. 11:15am

Two-dimensional complex dynamics displays a number of phenomena that are not observable in dimension one. However, if f is moderately dissipative then there are deeper similarities between the two fields. For instance, dynamics on an invariant Fatou component admits a nearly complete description:

THEOREM 1. Any invariant component D of the Fatou set is either an attracting basin or parabolic basin, or the basin of a rotation domain (Siegel disk or Herman ring).

THEOREM 2. In the first two cases, D contains a "critical point". In complex and real one-dimensional world, structurally stable maps are dense. In dimension two this fails because of the Newhouse phenomenon caused by homoclinic tangencies. Palis conjectured that in the real two-dimensional case this is the only reason for failure. We prove a complex version of this conjecture:

THEOREM 3. Any moderately dissipative polynomial automorphism of $\mathbb{C}^2$ is either "weakly stable" or it can be approximated by a map with homoclinic tangency.

Theorem 1 is joint with Han Peters, the rest is joint with Romain Dujardin.

John Milnor: *Hyperbolic Component Boundaries*

Saturday, August 23. 9:00am

This will be a discussion of hyperbolic components within an algebraic family of rational maps, studying how well behaved (or how badly behaved) the boundary of such a component can be.

Han Peters: *Polynomial skew products with wandering Fatou disks*

Tuesday, August 26. 10:15am

The existence of wandering Fatou components for polynomial maps in two variables is wide open. In general it is not at all clear how to approach this question. As a model we consider the problem for polynomial skew products, maps that preserve vertical complex planes. In his Ph.D. thesis from 2004, Krastio Lilov showed that in the neighborhood of an invariant super-attracting fiber there are no wandering Fatou components. In this talk I will briefly discuss his proof, and then show that his intermediate results are false in the geometrically attracting case. This is joint work with Liz Vivas.

Pascale Roesch: *Herman's condition and critical points on the boundary of Siegel disks of polynomials with two critical values*

Tuesday, August 26. 9:00am

We extend a theorem of Herman from the case of unicritical polynomials to the case of polynomials with two finite critical values. This theorem states that Siegel disks of such polynomials, under a diophantine condition (called Herman's condition) on the rotation number, must have a critical point on their boundaries. This is joint work with A. Chéritat.

Nikita Selinger: *Classification of Thurston maps with parabolic orbifolds*

Saturday, August 23. 3:45pm

In joint work with M. Yampolsky, we give a classification of Thurston maps with parabolic orbifolds based on our previous results on characterization of canonical Thurston obstructions. The obtained results yield a partial solution to the problem of algorithmically checking combinatorial equivalence of two Thurston maps.

Thomas Sharland: *Matings of cubic polynomials with a fixed critical point*

Saturday, August 23. 11:15am

We investigate the matings of pairs of cubic polynomials which have a fixed critical point. We will show that the only possible obstructions are Levy cycles. We will discuss similarities with the quadratic case and provide a simple condition under which the matings are obstructed.

Mitsuhiro Shishikura: *Tropical Complex Dynamics*

Saturday, August 23. 4:45pm

Rational maps often support invariant conformal structures on their Fatou sets and can be deformed by quasiconformal mappings. If we focus on the stretching deformation of invariant collection of annuli arising from attracting and super attracting basins, Siegel disks and Herman rings, the limit of the deformation usually degenerates to lower degree rational maps. We introduce an R-tree associated with such deformation together with a piecewise linear mapping on the tree, which describes the dynamics on the Fatou components, and discuss connections with quasiconformal surgery, etc.

John Smillie: *The complex Hénon family*

Monday, August 25. 2:30pm

It was about 30 years ago that John Hubbard began promoting the complex Hénon family as an interesting family of dynamical systems to investigate. I will discuss some recent projects with Eric Bedford and explain how they fit into this history.

Sebastian van Strien: *Quasisymmetric rigidity and applications*

Monday, August 25. 9:00am

In this talk I will discuss quasisymmetric rigidity in real dimension one, in its full generality and some applications.