Monday, November 19, 2018

3:00pm-4:00pm  **Student Dynamics**  -- Samantha Pinella (University of Michigan)  *The Boundary of Convex Divisible Sets*  
-- 1060 East Hall

4:00pm-5:00pm  **Complex Analysis, Dynamics and Geometry**  -- Araceli Bonifant (URI)  *External rays for some families of cubic polynomial maps*  
-- 3088 East Hall

4:00pm-5:00pm  **Student Combinatorics**  -- Jonathan Gerhard (University of Michigan)  *The interesting worlds of core partitions and numerical semigroups*  
-- 3866 East Hall

4:00pm-5:00pm  **Integrable Systems and Random Matrix Theory**  -- Deniz Bilman (University of Michigan)  *A robust inverse scattering transform for arbitrary singularities*  
-- 1866 East Hall

4:00pm-6:00pm  **Geometry & Physics**  -- Du Pei (Aarhus)  *Wild Higgs Bundles and Modular Categories*  
-- 4096 East Hall

Tuesday, November 20, 2018

3:00pm-4:00pm  **Student Geometry/Topology**  -- Mark Greenfield (University of Michigan)  *Solenoids: the top of a tower of covers*  
-- 1866 East Hall

4:00pm-5:00pm  **Colloquium Series**  -- Jennifer Balakrishnan (Boston University)  *Rational points on the cursed curve*  
-- 1360 East Hall
Abstracts for the week of November 18th, 2018 - November 24th, 2018

**Student Dynamics**  
Monday, November 19, 2018, 3:00pm-4:00pm  
1060 East Hall  
Samantha Pinella (University of Michigan)  
*The Boundary of Convex Divisible Sets*

I will introduce convex divisible sets and discuss how the boundary determines if they are a symmetric space.

**Complex Analysis, Dynamics and Geometry**  
Monday, November 19, 2018, 4:00pm-5:00pm  
3088 East Hall  
Araceli Bonifant (URI)  
*External rays for some families of cubic polynomial maps*

We study the parameter space $\mathcal{S}_p$ for cubic polynomials with a marked critical point of period $p$. We will show that for every escape region $\mathcal{E} \subset \mathcal{S}_p$, and every rational parameter angle $\phi$, the parameter ray $\mathfrak{R}_{\mathcal{E}}(\phi)$ lands at some uniquely defined point in the boundary of the escape region $\partial \mathcal{E}$. This point is necessarily either critically finite or parabolic. Joint work with John Milnor.
Student Combinatorics  
**Monday, November 19, 2018, 4:00pm-5:00pm**  
3866 East Hall  
Jonathan Gerhard (University of Michigan)  
*The interesting worlds of core partitions and numerical semigroups*

This talk will consist of an overview of an interesting overlap of worlds. A partition $\lambda$ is called a-core if $a$ does not divide any of the hook-lengths of the Young diagram of shape $\lambda$. This simple definition has important connections to geometry, modular representation theory, and the study of lattice paths. For example, the number of partitions that are simultaneously a-core and b-core (with $a$ and $b$ relatively prime) is related to generalized $(a,b)$-Catalan numbers. The usual $q$-Catalan numbers are related to Dyck paths by the Major statistic, but an analogue for the major statistic for $(a,b)$-Dyck paths is still unknown!

One connection that is particularly interesting is to numerical sets - a fancy way to say finite subsets of $\mathbb{N}$. These correspond nicely with partitions by using their indicator functions as a guideline for a lattice path. A numerical semigroup is a numerical set that is closed under addition. These turn out to act wonderfully under this correspondence and give us a nice way to construct core partitions. How else do these two worlds interact? We’ll try to find out!

**Integrable Systems and Random Matrix Theory**  
**Monday, November 19, 2018, 4:00pm-5:00pm**  
1866 East Hall  
Deniz Bilman (University of Michigan)  
*A robust inverse scattering transform for arbitrary singularities*

We propose a modification of the standard inverse scattering transform for the focusing nonlinear Schrödinger equation (also other equations by natural generalization) formulated with nonzero boundary conditions at infinity. The purpose is to deal with arbitrary-order poles and potentially severe spectral singularities in a simple and unified way. As an application, we use the modified transform to place the Peregrine solution and related higher-order "rogue wave" solutions in an inverse-scattering context for the first time. This allows one to directly study properties of these solutions such as their dynamical or structural stability, or their asymptotic behavior in the limit of high order. The modified transform method also allows rogue waves to be generated on top of other structures by elementary Darboux transformations, rather than the generalized Darboux transformations in the literature or other related limit processes.
We propose a new link between the moduli spaces of wild Higgs bundles and quantum invariants of 3-manifolds. The construction goes through a class of four-dimensional quantum field theories known as Argyres-Douglas theories. Every such theory realizes a wild Hitchin space as its Coulomb branch and defines a VOA on the Higgs branch. The latter can be used to construct a non-unitary modular tensor category, which leads to 3d TQFTs that are generically semisimple but non-unitary. This is based on joint work with Mykola Dedushenko, Sergei Gukov, Hiraku Nakajima and Ke Ye.

Student Geometry/Topology
Tuesday, November 20, 2018, 3:00pm-4:00pm
1866 East Hall
Mark Greenfield (University of Michigan)
Solenoids: the top of a tower of covers

Topological coverings of surfaces induce embeddings of their Teichmüller spaces. One might ask what happens if we repeat this construction through an infinite tower of covers. The universal hyperbolic solenoid results, and is an interesting object both on its own and for some applications. The solenoid can be endowed with complex structures, and has an infinite-dimensional Teichmüller space which contains the Teichmüller spaces of all closed surfaces. In this talk, we will introduce the solenoid and describe a few aspects of its Teichmüller space, noticing some interesting comparisons with the case of finite-type surfaces.

Colloquium Series
Tuesday, November 20, 2018, 4:00pm-5:00pm
1360 East Hall
Jennifer Balakrishnan (Boston University)
Rational points on the cursed curve

The split Cartan modular curve of level 13, also known as the "cursed curve," is a genus 3 curve defined over the rationals. By Faltings' proof of Mordell's conjecture, we know that it has finitely many rational points. However, Faltings' proof does not give an algorithm for finding these points. We discuss how to determine rational points on this curve using "quadratic Chabauty," part of Kim's nonabelian Chabauty program. This is joint work with Netan Dogra, Steffen Mueller, Jan Tuitman, and Jan Vonk.