### Monday, November 19, 2018

<table>
<thead>
<tr>
<th>Time</th>
<th>Seminar</th>
<th>Speaker</th>
<th>Location</th>
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<tr>
<td>3:00pm-4:00pm</td>
<td><strong>Student Dynamics</strong> -- Samantha Pinella (University of Michigan) <em>The Boundary of Convex Divisible Sets</em></td>
<td>Samantha Pinella (University of Michigan)</td>
<td>1060 East Hall</td>
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<td>4:00pm-5:00pm</td>
<td><strong>Complex Analysis, Dynamics and Geometry</strong> -- Araceli Bonifant (URI) <em>External rays for some families of cubic polynomial maps</em></td>
<td>Araceli Bonifant (URI)</td>
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<td><strong>Student Combinatorics</strong> -- Jonathan Gerhard (University of Michigan) <em>The interesting worlds of core partitions and numerical semigroups</em></td>
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<td><strong>Integrable Systems and Random Matrix Theory</strong> -- Deniz Bilman (University of Michigan) <em>A robust inverse scattering transform for arbitrary singularities</em></td>
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<td><strong>Geometry &amp; Physics</strong> -- Du Pei (Aarhus) <em>Wild Higgs Bundles and Modular Categories</em></td>
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<td>Jennifer Balakrishnan (Boston University)</td>
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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 $\mathbb{Z}$. 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.
Geometry & Physics  
Monday, November 19, 2018, 4:00pm-6:00pm  
4096 East Hall  
Du Pei (Aarhus)  
*Wild Higgs Bundles and Modular Categories*

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.