### Monday, April 09, 2018

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
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</tr>
</thead>
<tbody>
<tr>
<td>12:00pm-1:00pm</td>
<td><strong>Mathematical Biology</strong> -- Carmen Canavier (LSU School of Medicine)</td>
<td><em>Multiple gamma mechanisms co-exist in an excitatory/inhibitory network</em> -- 335 West Hall</td>
</tr>
<tr>
<td>3:10pm-4:00pm</td>
<td><strong>RTG Workshops/Lectures</strong> -- Jeffrey Danciger (U Texas)</td>
<td><em>CONVEX COCOMPACT SUBGROUPS IN REAL PROJECTIVE GEOMETRY I: Introduction to convex real projective structures and divisible convex sets. Two definitions of convex cocompact subgroup in real projective space</em> -- 4096 East Hall</td>
</tr>
<tr>
<td>4:00pm-5:00pm</td>
<td><strong>Complex Analysis, Dynamics and Geometry</strong> -- Takahiro Shibata (Kyoto University)</td>
<td><em>Ample canonical heights for endomorphisms on projective varieties</em> -- 3096 East Hall</td>
</tr>
<tr>
<td>4:00pm-5:00pm</td>
<td><strong>Student Combinatorics Seminar</strong> -- Combinatorics Grad Students (University of Michigan)</td>
<td><em>Bring Your Work to Work Day!</em> -- 3866 East Hall</td>
</tr>
<tr>
<td>4:10pm-5:30pm</td>
<td><strong>Group, Lie and Number Theory</strong> -- Jeffrey Adams (Univ of Maryland)</td>
<td><em>Unipotent Representations of Real Groups</em> -- 4088 East Hall</td>
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### Tuesday, April 10, 2018

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<thead>
<tr>
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<tbody>
<tr>
<td>11:30am-1:00pm</td>
<td><strong>Special Events</strong> -- ()</td>
<td><em>IBL Lunch</em> -- 4866 East Hall</td>
</tr>
<tr>
<td>3:00pm-4:00pm</td>
<td><strong>Student Geometry/Topology</strong> -- ()</td>
<td><em>Replaced by RTG Lecture series this week</em> -- 3866 East Hall</td>
</tr>
<tr>
<td>3:00pm-4:00pm</td>
<td><strong>Student Commutative Algebra</strong> -- Robert Walker (University of Michigan)</td>
<td><em>What is...a Waldschmidt constant?</em> -- 3096 East Hall</td>
</tr>
<tr>
<td>3:00pm-4:00pm</td>
<td><strong>Student Representation Theory</strong> -- Gabe Frieden (University of Michigan)</td>
<td><em>The boson-fermion correspondence</em> -- 1866 East Hall</td>
</tr>
<tr>
<td>3:10pm-4:00pm</td>
<td><strong>RTG Workshops/Lectures</strong> -- Jeffrey Danciger (U Texas)</td>
<td><em>CONVEX COCOMPACT SUBGROUPS IN REAL PROJECTIVE GEOMETRY II: Some properties of and theorems about convex cocompact subgroups</em> -- 3866 East Hall</td>
</tr>
<tr>
<td>4:10pm-5:00pm</td>
<td><strong>Colloquium Series</strong> -- Gunther Uhlmann (University of Washington)</td>
<td><em>Ziwet Colloquium: Harry Potter's Cloak via Transformation Optics</em> -- 1360 East Hall</td>
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### Wednesday, April 11, 2018

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<tbody>
<tr>
<td>4:00pm-5:00pm</td>
<td><strong>Financial/Actuarial Mathematics</strong> -- Jianfeng Zhang (USC)</td>
<td><em>A Martingale Approach for Fractional Brownian Motions and Related Path Dependent PDEs</em> -- 1360 East Hall</td>
</tr>
<tr>
<td>4:00pm-5:00pm</td>
<td><strong>Special Events</strong> -- Gunther Uhlmann (University of Washington)</td>
<td><em>Ziwet Lecture 2: Journey to the Center of the Earth</em> -- B844 East Hall</td>
</tr>
<tr>
<td>4:10pm-5:30pm</td>
<td><strong>Algebraic Geometry</strong> -- Zili Zhang (UM)</td>
<td><em>Simpson correspondence and the P=W conjecture</em> -- 4096 East Hall</td>
</tr>
<tr>
<td>4:10pm-5:30pm</td>
<td><strong>RTG Workshops/Lectures</strong> -- Fanny Kassel (IHES)</td>
<td><em>CONVEX COCOMPACT SUBGROUPS IN REAL PROJECTIVE GEOMETRY III: Introduction to Anosov subgroups/representations</em> -- 3866 East Hall</td>
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### Thursday, April 12, 2018

<table>
<thead>
<tr>
<th>Time</th>
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<tbody>
<tr>
<td>3:00pm-4:00pm</td>
<td><strong>Commutative Algebra</strong> -- Jason McCullough (Iowa State University) <em>Graded Shifts and the Shapes of Free Resolutions</em> -- B735 East Hall</td>
</tr>
<tr>
<td>3:00pm-4:00pm</td>
<td><strong>Topology</strong> -- Fanny Kassel (IHES) <em>Topology seminar replaced with RTG Lectures Series</em> -- 1866 East Hall</td>
</tr>
<tr>
<td>3:10pm-4:00pm</td>
<td><strong>RTG Workshops/Lectures</strong> -- Fanny Kassel (IHES) <em>Convex cocompact subgroups in real projective geometry IV: The relationship between convex cocompactness and Anosovness for subgroups of the projective general linear group</em> -- 1866 East Hall</td>
</tr>
<tr>
<td>4:00pm-5:00pm</td>
<td><strong>Differential Equations</strong> -- Michael Weinstein (Columbia University) <em>Honeycomb structures and Edge States</em> -- 4088 East Hall</td>
</tr>
<tr>
<td>4:00pm-5:00pm</td>
<td><strong>Student Dynamics</strong> -- Yonatan Shelah (University of Michigan) <em>An introduction to complex dynamics in higher dimensions</em> -- 1866 East Hall</td>
</tr>
<tr>
<td>4:00pm-5:30pm</td>
<td><strong>Logic</strong> -- Osvaldo Guzman Gonzalez (York University) <em>On weakly universal functions</em> -- 3088 East Hall</td>
</tr>
<tr>
<td>4:10pm-5:00pm</td>
<td><strong>Preprint Algebraic Geometry Seminar</strong> -- Karen Smith (UM) <em>Bertini Theorems for F-signature (following Carvajal-Rojas, Schwede, Tucker)</em> -- 2866 East Hall</td>
</tr>
<tr>
<td>5:00pm-6:00pm</td>
<td><strong>Differential Equations</strong> -- Gunther Uhlmann (University of Washington) <em>Zwet Lecture 3: Seeing Through Space and Time</em> -- 4088 East Hall</td>
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### Friday, April 13, 2018

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>10:00am-11:00am</td>
<td><strong>Symplectic Reading Group</strong> -- Dan Burns (UM) <em>Quantum speed limit vs. classical displacement energy (after L. Charles and L. Polterovich)</em> -- 1360 East Hall</td>
</tr>
<tr>
<td>12:10pm-2:00pm</td>
<td><strong>Student Homotopy Theory</strong> -- Montek Gill (University of Michigan) <em>Higher algebra and the Goodwillie calculus</em> -- 1360 East Hall</td>
</tr>
<tr>
<td>3:00pm-4:00pm</td>
<td><strong>Applied Interdisciplinary Mathematics (AIM)</strong> -- Kevin Hannay (Schreiner University) <em>Macroscopic models for coupled biological oscillators</em> -- 1084 East Hall</td>
</tr>
<tr>
<td>3:10pm-4:00pm</td>
<td><strong>RTG Workshops/Lectures</strong> -- Jeffrey Danciger (U Texas) <em>Convex cocompact subgroups in real projective geometry V: Examples from Vinberg's theory of reflection groups in projective space</em> -- 3866 East Hall</td>
</tr>
<tr>
<td>3:10pm-4:00pm</td>
<td><strong>Student Algebraic Geometry</strong> -- Nancy Wang (UM) <em>An intro to derived categories and Beilinson's theorem</em> -- 3096 East Hall</td>
</tr>
<tr>
<td>3:10pm-5:00am</td>
<td><strong>Geometry</strong> -- Jeffrey Danciger (U Texas) <em>Geometry seminar - joint with RTG Lecture Series</em> -- 3866 East Hall</td>
</tr>
<tr>
<td>4:10pm-5:00pm</td>
<td><strong>Student AIM Seminar</strong> -- Tyler Bolles (University of Michigan) <em>Topographically induced non-Gaussian water waves</em> -- 1084 East Hall</td>
</tr>
<tr>
<td>4:10pm-5:00pm</td>
<td><strong>Combinatorics</strong> -- Robert Walker (University of Michigan) <em>Hearing the limiting shape of a hypersurface configuration</em> -- 4088 East Hall</td>
</tr>
<tr>
<td>4:10pm-5:00pm</td>
<td><strong>RTG Workshops/Lectures</strong> -- Fanny Kassel (IHES) <em>Convex cocompact subgroups in real projective geometry VI: Additional topics and open questions</em> -- 3868 East Hall</td>
</tr>
</tbody>
</table>
Mathematical Biology
Monday, April 09, 2018, 12:00pm-1:00pm
335 West Hall
Carmen Canavier (LSU School of Medicine)

Multiple gamma mechanisms co-exist in an excitatory/inhibitory network

Gamma oscillations have been implicated in many cognitive functions. Fast spiking interneurons are thought to play an important role in gamma synchrony. Recently, fast spiking interneurons in the entorhinal cortex have been shown to exhibit type 2 excitability and postinhibitory rebound (PIR). Theoretical work has shown that these properties make interneuronal network gamma (ING) more robust than in networks of type 1 interneurons. Here we show that this robust ING persists in a sparsely connected excitatory network. We also show that phase response curve (PRC) theory can predict under what circumstances the interneurons will sparsely synchronize in two clusters, and how increasing the delay and/or the conductance destabilizes two clusters in favor of a single cluster.

RTG Workshops/Lectures
Monday, April 09, 2018, 3:10pm-4:00pm
4096 East Hall
Jeffrey Danciger (U Texas)

CONVEX COCOMPACT SUBGROUPS IN REAL PROJECTIVE GEOMETRY I: Introduction to convex real projective structures and divisible convex sets. Two definitions of convex cocompact subgroup in real projective space

This series of lectures is about a theory of convex cocompactness for discrete subgroups of the projective general linear group acting on real projective space. These groups display geometric and dynamical behavior similar to convex cocompact groups in rank one Lie groups (hyperbolic geometry) with some interesting differences. Some of this lecture series is based on joint work with Francois Gueritaud.
Given a smooth projective variety on a number field and an endomorphism on it, we would like to know how the height of a point grows by iteration of the action of the endomorphism. When the endomorphism is polarized, Call and Silverman construct the canonical height, which is an important tool for the calculation of growth of heights. In this talk, we will give a generalization of the Call-Silverman canonical heights for not necessarily polarized endomorphisms, ample canonical heights, and propose an analogue of the Northcott finiteness theorem as a conjecture. We will see that the conjecture holds when the variety is an abelian variety or a surface.

Student Combinatorics Seminar

Several graduate students will give short presentations on some combinatorics they've recently been thinking about.

Group, Lie and Number Theory

In 1980 Jim Arthur conjectured the existence of certain unipotent representations of reductive groups over local fields, which should play a fundamental role in the study of automorphic forms. Arthur did not give a definition of these representations (only some properties), and they are still not well understood, even in the case of Archimedean fields. I will discuss progress on the case of the real field. An aspect of this is the Atlas of Lie Groups and Representations, which is a software project to, among other things, understand unipotent representations and the unitary dual of real reductive groups.

Special Events

The last IBL lunch of the semester will be Tuesday, April 10 from 11:30am to 1pm. It will take place in the faculty lounge (4866 EH), and you should feel free to come for any length of time. Lunch will be provided.
Student Geometry/Topology  
**Tuesday, April 10, 2018, 3:00pm-4:00pm**  
3866 East Hall  

*Replaced by RTG Lecture series this week*

Student Commutative Algebra  
**Tuesday, April 10, 2018, 3:00pm-4:00pm**  
3096 East Hall  
Robert Walker (University of Michigan)  

*What is...a Waldschmidt constant?*  

I'll discuss an numerical invariant of homogenous polynomial ideals as it intersects with various topics in commutative algebra and algebraic geometry. It will resurge with a cameo in my talk in the U-M Combinatorics seminar on Friday. I aim for this to be a truncated survey talk of about 30 minutes duration, where I name-drop a handful of facts, omitting proofs.

Student Representation Theory  
**Tuesday, April 10, 2018, 3:00pm-4:00pm**  
1866 East Hall  
Gabe Frieden (University of Michigan)  

*The boson-fermion correspondence*  

The boson-fermion correspondence is an isomorphism between the symmetric and exterior algebras of a vector space of countably infinite dimension. The name comes from the fact that bosons are particles which can share the same state (like the factors in an element of the symmetric algebra), whereas fermions must occupy distinct states (like the factors in an element of the exterior algebra). The isomorphism is interesting because it is compatible with the actions of various Lie algebras (the Heisenberg Lie algebra, gl\_infty, affine sl\_n) on each space. The correspondence is closely related to the combinatorics of partitions and Schur functions, and it has been used to prove combinatorial and probabilistic results.

This talk will be an introduction to the algebraic objects mentioned above, with an emphasis on their combinatorial interpretations. As an application, we will see how the boson-fermion correspondence immediately implies the Murnaghan--Nakayama formula for characters of the symmetric group.
RTG Workshops/Lectures  
Tuesday, April 10, 2018, 3:10pm-4:00pm  
3866 East Hall  
Jeffrey Danciger (U Texas)  
**CONVEX COCOMPACT SUBGROUPS IN REAL PROJECTIVE GEOMETRY II: Some properties of and theorems about convex cocompact subgroups**

This series of lectures is about a theory of convex cocompactness for discrete subgroups of the projective general linear group acting on real projective space. These groups display geometric and dynamical behavior similar to convex cocompact groups in rank one Lie groups (hyperbolic geometry) with some interesting differences. Some of this lecture series is based on joint work with Francois Gueritaud.

Colloquium Series  
Tuesday, April 10, 2018, 4:10pm-5:00pm  
1360 East Hall  
Gunther Uhlmann (University of Washington )  
**Ziwet Colloquium: Harry Potter's Cloak via Transformation Optics**

Can we make objects invisible? This has been a subject of human fascination for millennia in Greek mythology, movies, science fiction, etc. including the legend of Perseus versus Medusa and the more recent Star Trek and Harry Potter. In the last decade or so there have been several scientific proposals to achieve invisibility. We will introduce some of these in a non-technical fashion concentrating on the so-called "transformation optics" that has received the most attention in the scientific literature.

Reception for the Speaker to Follow in the Upper Atrium of East Hall on Tuesday, April 10, 2018  
Sponsored by the Ziwet Lecture Series

Financial/Actuarial Mathematics  
Wednesday, April 11, 2018, 4:00pm-5:00pm  
1360 East Hall  
Jianfeng Zhang (USC)  
**A Martingale Approach for Fractional Brownian Motions and Related Path Dependent PDEs**

Recent empirical studies show that volatility could be rough, and thus it is natural to use Fractional Brownian Motion (fBM) to model the volatility. We are interested in the derivative pricing and hedging theory in such a model. However, fBM is neither a Markov process nor a semimartingale, then many standard methods relying on PDEs and/or martingales fail in this setting. By introducing the so called forward volatility as extra state variables, we “recover” the standard theory in this setting by using path dependent PDEs. Our main tool is a new functional Ito formula, in the spirit of Dupire.

This is a joint work with Frederi Viens.
We will consider the inverse problem of determining the sound speed or index of refraction of a medium by measuring the travel times of waves going through the medium. This problem arises in global seismology in an attempt to determine the inner structure of the Earth by measuring travel times of earthquakes. It has also several applications in optics and medical imaging among others.

The problem can be recast as a geometric problem: Can one determine the Riemannian metric of a Riemannian manifold with boundary by measuring the distance function between boundary points? This is the boundary rigidity problem. We will also consider the problem of determining the metric from the scattering relation, the so-called lens rigidity problem. The linearization of these problems involve the integration of a tensor along geodesics, similar to the X-ray transform.

We will also describe some recent results, join with Plamen Stefanov and Andras Vasy, on the partial data case, where you are making measurements on a subset of the boundary. No previous knowledge of Riemannian geometry will be assumed.

Given a compact complex curve, Simpson correspondence asserts that there exists a canonical diffeomorphism between the moduli space of representations of the fundamental group of the curve and the moduli space of Higgs bundles over the curve. The P=W conjecture predicts that via this (non-algebraic) diffeomorphism, the mixed Hodge structure and the perverse filtration correspond. In this talk, I will discuss how the multiplicativity of perverse filtrations and curious hard Lefschetz are related to the P=W conjecture. As concrete examples, I will introduce five families of Hitchin systems which are Hilbert schemes of points on surfaces. I will discuss why the perverse filtrations associated with these five families of Hitchin maps are multiplicative. The same method works for Hilbert schemes of points of elliptic K3 surfaces.
RTG Workshops/Lectures

Wednesday, April 11, 2018, 4:10pm-5:30pm
3866 East Hall
Fanny Kassel (IHES)

CONVEX COCOMPACT SUBGROUPS IN REAL PROJECTIVE GEOMETRY III: Introduction to Anosov subgroups/representations

This series of lectures is about a theory of convex cocompactness for discrete subgroups of the projective general linear group acting on real projective space. These groups display geometric and dynamical behavior similar to convex cocompact groups in rank one Lie groups (hyperbolic geometry) with some interesting differences. Some of this lecture series is based on joint work with Francois Gueritaud.

Commutative Algebra

Thursday, April 12, 2018, 3:00pm-4:00pm
B735 East Hall
Jason McCullough (Iowa State University)

Graded Shifts and the Shapes of Free Resolutions

Let I be a homogeneous ideal in a polynomial ring $S = K[x_1,...,x_n]$ over a field $K$. Many of the properties of the homogeneous ideal associated to I can be determined from the minimal graded free resolution of I. In my talk I will discuss some progress on understanding the maximal graded shifts (i.e. degrees of syzygy modules) of ideals and modules over $S$. I will present some new restrictions on the maximal graded shifts of ideals, which can be thought of as restrictions on the shapes of the nonzero entries in the graded Betti table of an ideal.


Topology

Thursday, April 12, 2018, 3:00pm-4:00pm
1866 East Hall
Fanny Kassel (IHES)

*Topology seminar replaced with RTG Lectures Series

See RTG Workshops/Lectures for details
RTG Workshops/Lectures
Thursday, April 12, 2018, 3:10pm-4:00pm
1866 East Hall
Fanny Kassel (IHES)

**CONVEX COCOMPACT SUBGROUPS IN REAL PROJECTIVE GEOMETRY IV:** The relationship between convex cocompactness and Anosovness for subgroups of the projective general linear group

This series of lectures is about a theory of convex cocompactness for discrete subgroups of the projective general linear group acting on real projective space. These groups display geometric and dynamical behavior similar to convex cocompact groups in rank one Lie groups (hyperbolic geometry) with some interesting differences. Some of this lecture series is based on joint work with Francois Gueritaud.

Differential Equations
Thursday, April 12, 2018, 4:00pm-5:00pm
4088 East Hall
Michael Weinstein (Columbia University)

**Honeycomb structures and Edge States**

We review recent progress on the propagation of waves for the 2D Schrödinger and Maxwell equations for media with the symmetry of a hexagonal tiling of the plane.

Student Dynamics
Thursday, April 12, 2018, 4:00pm-5:00pm
1866 East Hall
Yonatan Shelah (University of Michigan)

**An introduction to complex dynamics in higher dimensions**

I will introduce the Fatou, Julia and indeterminacy sets for meromorphic functions on \( \mathbb{P}^n \). Special attention will be paid to some surprising differences from the one-dimensional case of rational functions.
A function $U:\omega_1^2 \rightarrow 2$ is called universal if for every function $F:\omega_1^2 \rightarrow \omega$ there is an injective function $h:\omega_1 \rightarrow \omega_1$ such that $F(\alpha, \beta) = U(h(\alpha), h(\beta))$ for each $\alpha, \beta \in \omega_1$. It is easy to see that universal functions exist assuming the Continuum Hypothesis, furthermore, by results of Shelah and Mekler, the existence of such functions is consistent with the continuum being arbitrarily large. Universal functions were recently studied by Shelah and Steprans, where they showed that the existence of universal graphs is consistent with several values of the dominating and unbounded numbers. They also considered several variations of universal functions, in particular, the following notion was studied: A function $U:\omega_1^2 \rightarrow \omega$ is $(1, \omega_1)$-weakly universal if for every $F:\omega_1^2 \rightarrow \omega$ there is an injective function $h:\omega_1 \rightarrow \omega_1$ and a function $e:\omega \rightarrow \omega$ such that $F(\alpha, \beta) = eU(h(\alpha), h(\beta))$ for every $\alpha, \beta \in \omega_1$. Shelah and Steprans asked if $(1, \omega_1)$-weakly universal functions exist in ZFC. We will study the existence of $(1, \omega_1)$-weakly universal functions in Sacks models and provide an answer to their problem.

Preprint Algebraic Geometry Seminar
Thursday, April 12, 2018, 4:10pm-5:30pm
2866 East Hall
Karen Smith (UM)

Bertini Theorems for $F$-signature (following Carvajal-Rojas, Schwede, Tucker)

https://arxiv.org/abs/1710.01277
We consider inverse problems for the Einstein equation with a time-depending metric on a 4-dimensional globally hyperbolic Lorentzian manifold. We formulate the concept of active measurements for relativistic models. We do this by coupling Einstein equations with equations for scalar fields.

The inverse problem we study is the question of whether the observations of the solutions of the coupled system in an open subset of the space-time with the sources supported in this set determines the properties of the metric in a larger domain. To study this problem we define the concept of light observation sets and show that knowledge of these sets determine the conformal class of the metric. This corresponds to passive observations from a distant area of space which is filled by light sources.

We will start by considering inverse problems for scalar non-linear hyperbolic equations to explain our method. No previous knowledge of Lorentzian geometry or general relativity will be assumed. This is joint work with P. Hinz, Y. Kurylev, M. Lasss and Y. Wang.

Quantum speed limit vs. classical displacement energy (after L. Charles and L. Polterovich)

Here is the abstract for the paper:
"We discuss a link between symplectic displacement energy, a fundamental notion of symplectic topology, and the quantum speed limit, a universal constraint on the speed of quantum-mechanical processes. The link is provided by the quantum-classical correspondence formalized within the framework of the Berezin-Toeplitz quantization."

More specifically, the authors improve the "quantum speed limit" using Hofer displacement energy. The underlying question is the relation between quantum independence of a future state of a system and the analogous Hamiltonian displacement properties of such states in the classical (non-quantum) framework. The topics are based on themes previously discussed in the SRG, especially Alejandro Uribe's discussion of geometric quantization. The talk will only set the context of the discussion and indicate results and directions, i.e., there will not be time for detailed exposition of the techniques.
The first part of this talk will describe higher algebra, which refers to algebraic structures which are analogous to the usual ones except that conditions such as associativity and commutativity are required only up to higher and coherent homotopies. For example, spectra are the higher analogue of abelian groups. I will describe the construction of higher structures first via topological operads and then via infinity-operads. The second part of the talk will describe the Goodwillie calculus, a calculus for homotopical functors. Again, I will first describe a topological approach, and then an infinity-categorical approach. I will use this calculus to give one possible precise formulation of how the passage from spaces to spectra is a linearization.

We consider large systems of coupled limit cycle oscillators and develop a new approach for the systematic extraction of low-dimensional “macroscopic models” describing the dynamics of these systems. We identify an elegant structure in the phase distribution of experimental and simulated coupled biological oscillators. Further, we characterize the emergence of this structure using a simple argument based only on the general phase-locking behavior of coupled oscillators. We demonstrate how this structure may be applied as an ansatz to derive low-dimensional macroscopic models and apply it to derive a low-dimensional model for human circadian rhythms. Finally, we fit the human model to experimental data and compare the predictions to a predominant phenomenological model for human circadian rhythms.

This series of lectures is about a theory of convex cocompactness for discrete subgroups of the projective general linear group acting on real projective space. These groups display geometric and dynamical behavior similar to convex cocompact groups in rank one Lie groups (hyperbolic geometry) with some interesting differences. Some of this lecture series is based on joint work with Francois Gueritaud.
**Student Algebraic Geometry**  
Friday, April 13, 2018, 3:10pm-4:00pm  
3096 East Hall  
Nancy Wang (UM)  
*An Intro to Derived Categories and Beilinson's Theorem*

This will be an introduction to derived categories. We will give an overview of the calculus of fractions and how it can be used to show the existence of the derived category of an abelian category as the localization of the homotopy category of chain complexes. Then we will show a couple of applications of the derived category, predominantly a theorem of Beilinson which describes the derived category of $\mathbb{P}^n$. This talk will be accessible to anyone currently taking math 632.

**Geometry**  
Friday, April 13, 2018, 3:10pm-5:00am  
3866 East Hall  
Jeffrey Danciger (U Texas)  
*Geometry seminar - joint with RTG Lecture Series*

**Student AIM Seminar**  
Friday, April 13, 2018, 4:10pm-5:00pm  
1084 East Hall  
Tyler Bolles (University of Michigan)  
*Topographically induced Non-Gaussian Water Waves*

Rogue waves have been of great interest in recent times with several proposed generation mechanisms currently under investigation. We present new laboratory experiments that reveal that bathymetry can qualitatively alter the distribution of randomized surface waves; a normally-distributed incoming wave field becomes skewed and highly non-Gaussian after encountering a step in terrain. A short distance downstream of the step, the wave-field is very accurately characterized by the gamma distribution, affording simple estimates for the skewness, kurtosis, and other statistical properties. Importantly, the exponential decay of the gamma distribution is much slower than Gaussian decay, signifying that extreme events occur more frequently. Our results also show that popular measures of rogue activity may be misleading. Clean linear regressions in surface probability distribution parameters as a function of forcing amplitude allow for more quantitative work in the future.
Combinatorics  
Friday, April 13, 2018, 4:10pm-5:00pm  
4088 East Hall  
Robert Walker (University of Michigan)  
*Hearing the Limiting Shape of a Hypersurface Configuration*

There is a niche body of work on limiting shapes, i.e., asymptotic Newton polyhedra, of symbolic generic initial systems considered for polynomial rings in characteristic zero (e.g., by my academic sister Sarah Mayes-Tang, and separately by Dumnicki, Szemberg, Szpond, and Tutaj-Gasinska, a quartet of Polish mathematicians). In particular, in one joint paper the latter four authors compute the limiting shape for ideals defining zero-dimensional star configurations in projective space--star configurations turn out to be a steady source of a lot of interesting "ALGECOM" phenomenology. In this talk, we discuss work-in-progress to generalize their computation to the case of ideals defining zero-dimensional configurations in projective space determined by hypersurfaces of a common fixed degree. Along the way, we draw connections to a 2015 investigation (published in Transactions of the AMS in 2017) of select homological and asymptotic properties of hypersurface and matroidal configurations by Geramita, Harbourne, Migliore, and Nagel. I'll aim to close the talk by indicating how we might see--or "hear"--select asymptotic numerical invariants in the limiting shape: Waldschmidt constants, asymptotic Castelnuovo-Mumford regularity, and resurgences for homogeneous polynomial ideals.

RTG Workshops/Lectures  
Friday, April 13, 2018, 4:10pm-5:00pm  
3868 East Hall  
Fanny Kassel (IHES)  
*CONVEX COCOMPACT SUBGROUPS IN REAL PROJECTIVE GEOMETRY VI: Additional topics and open questions*

This series of lectures is about a theory of convex cocompactness for discrete subgroups of the projective general linear group acting on real projective space. These groups display geometric and dynamical behavior similar to convex cocompact groups in rank one Lie groups (hyperbolic geometry) with some interesting differences. Some of this lecture series is based on joint work with Francois Gueritaud.