Abstracts

#1. Algebraic Geometry—*organizer*: Shigeru Mukai, RIMS Kyoto University

PL **Shigeru Mukai**
RIMS Kyoto University

1-1 **Jungkai Alfred Chen**
National Taiwan University

1-2 **Christopher Hacon**
University of Utah

Boundedness results in birational algebraic geometry

In this talk, we will survey boundedness results in complex birational algebraic geometry. In particular, we will discuss a result of Tsuji, Hacon-Mc Kernan, and Takayama on the boundedness of birational maps of varieties of general type. We will then discuss several natural generalizations and applications of this result.

1-3 **Masayuki Kawakita**
RIMS Kyoto University

Singularities in the minimal model program

One approach to the termination of flips is to evaluate how singularities are improved by flips. We will discuss an invariant of singularity called the minimal log discrepancy, contrasting with another invariant called the log canonical threshold.

1-4 **Bumsig Kim**
Korea Institute for Advanced Study

Stable Quasimaps to Holomorphic Symplectic Quotients

We apply the stable (twisted) quasimap construction to holomorphic symplectic quotients and obtain moduli spaces with symmetric obstruction theories.

1-5 **Ichiro Shimada**
Hiroshima University

Lattices of algebraic cycles in positive characteristics

By means of the incidence relation of Frobenius images of linear subspaces in a fixed vector space over a finite field of q elements, we construct examples of varieties defined over the finite field such that all the Frobenius eigenvalues on the l-adic cohomology are powers of q. We then investigate the lattices spanned by the numerical equivalence classes of algebraic cycles on these varieties, and show that some of them yield a dense sphere packing.

1-6 **Yu-jong Tzeng**
Stanford University & Harvard University

Universal Formulas for Counting Nodal Curves on Surfaces

The problem of counting nodal curves on algebraic surfaces has been studied since the nineteenth century. On the projective space $\mathbb{P}^2$, it asks how many curves defined by homogeneous degree d polynomials have only nodes as singularities and pass through points in general position. On K3 surfaces, the number of rational nodal curves was predicted by the Yau-Zaslow formula. Göttsche conjectured that for sufficiently ample line bundles L on algebraic surfaces, the numbers of nodal curves in |L| are given by universal polynomials in four topological numbers. Furthermore, based on the Yau-Zaslow formula he gave a conjectural generating function in terms of quasi-modular

forms and two unknown series. In this talk, I will discuss how degeneration methods can be applied to count nodal curves and sketch my proof of Göttsche's conjecture.

#2. Combinatorics—*organizer*: Xuding Zhu, National Sun Yat-sen University

PL **Persi Diaconis**
Stanford University

Adding numbers, shuffling cards, and an amazing matrix

The "carries" when a list of numbers are added form a Markov chain (Holte). The transition matrix of this Markov chain also occurs in analyzing the usual method of riffle shuffling cards. The left and right eigen functions are characters of Foulkes (on S_n) and Reutenaur (on lie_n). The same matrix appears in understanding high Veronese imbeddings of projective varieties. All of this is joint work with Jason Fulman.

2-1 **Pavol Hell**
Simon Fraser University

List Homomorphism Problems

Dichotomy for list homomorphisms for digraphs follows from a general result of A. Bulatov on conservative constraint satisfaction problems. We provide the first polynomial time digraph structure dichotomy classification, similar to early dichotomy list homomorphism results for undirected graphs. This is joint work with Arash Rafiey.

2-2 **Alexandr Kostochka**
University of Illinois–Urbana-Champaign

List Coloring of Simple Hypergraphs

The *list chromatic number* $\chi_\ell(G)\,(G)$ of a hypergraph $G=(V,E)$ is the minimum integer s such that for every assignment of a list L_v of s colors to each vertex v of G, there is a vertex coloring of G in which the color of each vertex is in its list and there are no monochromatic edges. Before 2000, Alon proved that every graph with "high" average degree cannot have small list chromatic number. We prove that the same holds for simple r-uniform hypergraphs with a different notion of "high." Recall that a hypergraph is simple if no two edges have more than one common vertex. Note that non-simple n-vertex r-uniform hypergraphs may have average degree about $(n/r)^{r-2}$ and still be 2-list-colorable. This is joint work with Noga Alon.

2-3 **Jarik Nešetřil**
Charles University

2-4 **Zhi-Wei Sun**
Nanjing University

Super Congruences involving Binomial Coefficients and New Series for Famous Constants

If a p-adic congruence happens to hold modulo a higher power of p then it is called a super congruence. The topic of super congruences involving binomial coefficients is related to the p-adic Gamma function, Gauss and Jacobi sums, hypergeometric series, modular forms, Calabi-Yau manifolds, representations of p by certain quadratic forms, and some sophisticated combinatorial identities involving harmonic numbers. Recently the speaker formulated many conjectures on super congruences involving binomial

coefficients and revealed that they are related to Euler numbers and series for p or other famous constants. In this talk we will analyze few typical conjectures of the speaker and introduce related progress.

2-5 ***Gerard J. Chang***
National Taiwan University

On the number of subsequences with a given sum in a finite abelian group

Suppose G is a finite abelian group and S is a sequence of elements in G. For any element g of G, let $N_g(S)$ denote the number of subsequences of S with sum g. Our purpose is to investigate the lower bound for $N_g(S)$. In particular, we prove that either $N_g(S)=0$ or $N_g(S)\geq 2^{|S|-D(G)}+1$, where $D(G)$ is the smallest positive integer ℓ such that every sequence over G of length at least ℓ has a nonempty zero-sum subsequence. We also characterize the structures of the extremal sequences for which the equality holds for some groups. This is joint work with Sheng-Hua Chen, Yongke Qu, Guoqing Wangand Haiyan Zhang.

2-6 **Xingxing Yu**
Georgia Institute of Technology

#3. Differential Geometry—*organizer*: Seiki Nishikawa, Tohoku University

PL **Seiki Nishikawa**
Tohoku University

Harmonic maps into complex Finsler manifolds

The notion of harmonic maps has been extended recently to real/complex Finsler manifolds, which form a much larger class than Riemannian/Hermitian manifolds. In this talk, from the viewpoint of variational problems, we will discuss some basic properties of harmonic maps from compact Riemann surfaces into complex Finsler manifolds.

3-1 **Kazuo Akutagawa**
Tohoku University

The Yamabe invariant of cylindrical manifolds and computations of the orbifold Yamabe invariant

We prove some basic results on the Yamabe invariant of a cylindrical manifold, and particularly give a basic estimate from above for the invariant in the case of nonpositive one. We use these results to give some exact computations of the nonpositive Yamabe invariants of 4-dimensional compact orbifolds with finitely many singular points.

3-2 **Ben Andrews**
Australian National University

The fundamental gap on manifolds and on convex domains

I will present joint work with Julie Clutterbuck, concerning the spectral gap for the Laplacian in various settings. We use estimates on the heat equation to deduce properties of eigenfunctions and eigenvalues. First we give an estimate on the modulus of continuity of solutions to the heat equation, which recovers easily the optimal lower bound for the first eigenvalue on a compact manifold in terms of an upper bound for

diameter and a lower bound for Ricci curvature. This estimate was first proved by Kröger using gradient estimates in the spirit of Li and Yau, and includes as special cases the results of Zhong and Yang and of Lichnerowicz.

Secondly, for a convex domain in a manifold with constant sectional curvature κ, we prove a sharp new log-concavity estimate for the first Dirichlet eigenfunction: Precisely, we show that the decrease in slope of the log of the eigenfunction along any geodesic segment in the domain is no less than that on an interval of the same length for the first eigenfunction of a corresponding one-dimensional model problem. This combines with the modulus of concavity argument to give a sharp lower bound on the gap between the first two eigenvalues for Dirichlet Schrödinger operators in terms of the diameter of the domain, κ, and a "modulus of convexity" for the potential. The result is a sharp refinement of the result of Singer, Wong, Yau, and Yau, as well as the later improvement by Yu and Zhong. In particular, we prove that the gap on a convex domain in Euclidean space for a Schrödinger operator with convex potential is at least $3\pi^2/D^2$, where D is the diameter of the domain.

3-3 **Richard Schoen**
Stanford University

Sharp eigenvalue estimates and area bounds for stationary submanifolds and varifolds in Euclidean space

We will describe sharp lower bounds on the eigenvalues of the Dirichlet-Neumann map and connections to the geometry of the free boundary problem for the minimal submanifold problem. As a consequence, we will obtain sharp lower bounds on the possible areas of free boundary surfaces and varifolds in the Euclidean ball. This is a joint work with Ailana Fraser.

3-4 **Akito Futaki**
Tokyo Institute of Technology

Kähler geometry and asymptotic Chow semistability

I will explain about an example of a Kähler-Einstein manifold which is not asymptotically Chow semistable.

3-5 **Ko Honda**
University of Southern California

3-6 **Lei Ni**
UC-San Diego

#4. Electromagnetic Waves—*organizer*: Ya Yan Lu, City University of Hong Kong

PL **Gunther Uhlmann**
University of Washington

Transformation Optics and Cloaking

We describe recent theoretical and experimental progress on making objects invisible to detection by electromagnetic waves, acoustic waves and quantum waves. For the case of electromagnetic waves, Maxwell's equations have transformation laws that allow for

design of electromagnetic materials that steer light around a hidden region, returning it to its original path on the far side. Not only would observers be unaware of the contents of the hidden region, they would not even be aware that something was being hidden. The object, which would have no shadow, is said to be cloaked. We recount the recent history of the subject and discuss some of the mathematical issues involved.

4-1 **Gang Bao**
Michigan State University

4-2 **Jin Cheng**
Fudan University

4-3 **Hyeonbae Kang**
Inha University

4-4 **Hongyu Liu**
University of Washington

4-5 **Xudong Chen**
University of Singapore

#5. Functional Analysis—*organizer*: Xiaoman Chen, Fudan University

PL **Guoliang Yu**
Vanderbilt University

Geometric complexity and topological rigidity

In this talk, I will explain how a notion of geometric complextity can be used to study topological rigidity of manifolds. This is joint work with Erik Guentner and Romain Tessera.

5-1 **Guangfu Cao**
Guangzhou University

5-2 **Boo Rim Choe**
Korea University

Survey on the finite-rank product conjecture for Toeplitz operators

Let T_u be the Toeplitz operator with bounded symbol u on the Bergman space or Hardy space over a classical complex domain such as disk, ball, or polydisk. The subject of this talk is the following long-standing conjecture, which emerged from a classical work of Brown and Halmos (1964) on the Hardy space over the unit disk:

> **Conjecture.** *If* $T_{u_1}\cdots T_{u_N}=0$*, or, more generally,* $T_{u_1}\cdots T_{u_N}$ *has finite rank, then one of the symbols,* u_j *is zero a.e.*

The one-dimensional Hardy space case has been solved only recently by Aleman and Vukotić (2009) and the several-variable case remains open. The Bergman space case turns out to be more intriguing. The only result for the Bergman space is Luecking's solution (2008) for one single factor over the disk. While these are all the known results

for general bounded symbols, there are various partial results with certain additional hypotheses on symbols. In this talk we survey recent results towards the conjecture/problem as well as related results.

5-3 **Kunyu Guo**
Fudan University

Multiplication operators defined by covering maps on the Bergman space: the connection between operator theory and von Neumann algebras

In this talk, we will combine methods of complex analysis, operator theory, and conformal geometry to construct a class of type-II factors in the theory of von Neumann algebras, which arise essentially from holomorphic coverings of bounded planar domains. One will see how types of such von Neumann algebras are related to algebraic topology of planar domains. As a result, we establish fascinating connections to one of the long-standing problems in free group factors. An interplay of analytical, geometrical, operator and group theoretical techniques is intrinsic to this work. This is a joint work with Hansong Huang.

5-4 **Chunlan Jiang**
Hebei Normal University

5-5 **Tsuyoshi Kato**
Kyoto University

Growth of Casson handles and Yang-Mills gauge theory

Casson handles are open subsets with boundary, which appear inside smooth four manifolds. They are parametrized by signed infinite trees, and their growth measures complexity of smooth structure. In this talk we show that growth of any CH in K3 surface must be more than bounded type. It implies that the smooth structure is sufficiently "complex." In order to verify this, we construct Yang-Mills gauge theory over non compact smooth four manifolds, particularly over Casson handles of bounded type.

5-6 **Xianmin Xu**
Jiaxing University

#6. Kinetic Equations and Gas Dynamics—*organizer*: Seung Yeal Ha, Seoul National University

PL **Tai-Ping Liu**
Academia Sinica &
Stanford University

Hilbert's Sixth Problem

Hilbert's Sixth Problem is one of the Hilbert Problems which raises a general program and not a single unsolved problem. From Hilbert's statement, kinetic theory is his main concern. In this talk we review some of the progresses that have been made in recent decades concerning the two types of problems. The first is to derive the Boltzmann equation from the Liouville equation for interacting particles in the Boltzmann-Grad limit. The second is to study the zero mean free path limit in the derivation of fluid dynamics equations. Both limits are highly singular in their own way. We will discuss the rich phenomena pertaining to these limits and raise open problems.

6-1 Seung Yeal Ha
Seoul National University

Complete synchronization of Kuramoto oscillators

In this talk, I will discuss complete phase-frequency synchronization for the particle and kinetic Kuramoto models which are very popular model for the synchronization of limit-cycle oscillators. We present sufficient conditions for initial configurations leading to the exponential time-decay toward completely synchronized states characterized by initial configurations and natural frequencies. For the kinetic model, we provide the global existence of measure-valued solutions and their asymptotic behavior.

6-3 Kazuo Aoki
Kyoto University

Stokes fluid dynamics for a vapor-gas mixture derived from kinetic theory

When a vapor of a substance is in contact with its condensed phase, evaporation and condensation (or sublimation) take place on the interface between the vapor and the condensed phase. If we try to describe flows of the vapor with evaporation and/or condensation, we have to use kinetic theory even in the continuum limit, since the vapor is not in local equilibrium at the interface. In other words, even if the mean free path of the vapor molecules (or the Knudsen number based on it) is very small, we cannot derive correct fluid dynamics by macroscopic considerations. We can construct correct fluid-dynamic systems for small Knudsen numbers (including the continuum limit) only by considering the zero Knudsen number limit and its neighborhood on the basis of kinetic theory. In this paper, we present an example of the fluid-dynamic system for a vapor-gas mixture derived in this way. More specifically, we consider the situation where the vapor evaporates/condenses in the presence of another component that neither evaporates nor condenses (the noncondensable gas) and restrict ourselves to the steady flows. We further focus our attention on the case where the deviation of the system from the saturated equilibrium state at rest is small. We derive the correct fluid-dynamic system, composed of the fluid-dynamic equations of Stokes type, their correct boundary conditions, and the local corrections in the vicinity of the interface (Knudsen layer), from the linearized Boltzmann equation for a mixture of gases and its kinetic boundary condition at the interface by means of a formal but systematic asymptotic analysis for small Knudsen numbers.

6-4 Russel Caflisch
UCLA

Monte Carlo Simulation for Coulomb Collisions

Coulomb collisions between charged particles in a plasma are described by the Landau-Fokker-Planck collision operator. The collision operator can be interpreted as describing discrete binary collisions, each of which is an aggregate of many particle interactions. Takizuka and Abe (1977) formulated a Monte Carlo method for this binary collision law, and Bobylev and Nanbu (2000) developed a mathematical derivation of Monte Carlo methods for Coulomb collisions, including an alternative method of Nanbu (1997). This talk presents a convergence study for the methods of Takizuka and Abe and of Nanbu. We also present an accelerated hybrid method for Coulomb collisions that combines a Monte Carlo particle simulation and a fluid dynamic solver in a single uniform method throughout phase space.

6-5 **Dongho Chae**
Sungkyunkwan University

On the pressure of the incompressible fluids and the axisymmetric flows

In this talk we discuss some observations on the divergence free tensor field equation, $\operatorname{div} T=0$ in the classical field theories in $\mathbb{R}^N$. For classical fields and compressible fluid equations such that $T \in L^1(\mathbb{R}^N)$ this observation implies a Liouville type of results for stationary fields, while for the time dependent incompressible fluids it says that the region of positivity of the pressure is unbounded in $\mathbb{R}^N$. We can also extend some parts of these results to the case when $T \in L^p(\mathbb{R}^N), p>1$. For the 3D axisymmetric incompressible fluids without swirl it also says that the quantity $\int_{-\infty}^{\infty}(p+v_r^2)dx_3$ decreases monotonically in the radial direction. In the later part of the talk, we discuss observations related to the blow-up problem of the 3D axisymmetric Euler equations.

6-6 **Shinya Nishibata**
Tokyo Institute of Technology

Asymptotic behavior of solutions to the Euler-Poisson equation in plasma physics

6-7 **Shih-Hsien Yu**
National University of Singapore

Nonlinear wave propagations over a Boltzmann shock profile

In this talk, a scheme used to construct the wave propagations over a Boltzmann shock profile will be surveyed. This scheme is consistent of parallel processes to decompose a variable coefficient problem into constant coefficient problems plus a scalar equation to analyze the global wave interactions crossing the shock front. This reduction relies heavily on the Green's functions for the constant coefficient problems so that one can show the convergence of the scheme; and the solution obtained by the scheme is pointwise exponential sharp in the space-time domain.

#7. Mathematical Imaging—*organizer*: Zuowei Shen, National University of Singapore

PL **Emmanuel Candès**
Stanford University

Advances in low-rank matrix modeling: some theory and some computer vision applications

This talk is about a curious phenomenon. Suppose we have a data matrix, which is the superposition of a low-rank component and a sparse component. Can we recover each component individually? We prove that under some suitable assumptions, it is possible to recover both the low-rank and the sparse components exactly by solving a very convenient convex program. This suggests the possibility of a principled approach to robust principal component analysis since our methodology and results assert that one can recover the principal components of a data matrix even though a positive fraction of its entries are arbitrarily corrupted. This extends to the situation where a fraction of the entries are missing as well. In the second part of the talk, we present applications in the area of video surveillance, where our methodology allows for the detection of objects in a cluttered background, and in the area of face recognition, where it offers a principled way of removing shadows and specularities in images of faces. We also show

how the methodology can be adapted to simultaneously align a batch of images and correct serious defects/corruptions in each image.

Joint work with X. Li, Y. Ma, and J. Wright.

7-1 **Zuowei Shen**
National University of Singapore

7-2 **Bin Dong**
UCLA

Some Mathematical Models in Biomedical Shape Processing and Analysis

I will first discuss a tight frame based segmentation model, as well as a fast implementation, for general medical image segmentation problems. This model combines ideas of the frame-based image restoration models with ideas of the total variation-based segmentation models (convexified Chan-Vese model). Then I will move to the topic on biological shape processing and analysis, which is a rather popular topic lately in biomedical image analysis. Within this category, I will mainly discuss the following three topics: surface restoration via nonlocal means; brain aneurysm segmentation in 3-D biomedical images; and multiscale representation (MSR) or shapes and its applications in blood vessel recovery (surface inpainting) and others. Some future work and ongoing projects will be mentioned in the end.

7-3 **Hui Ji**
National University of Singapore

7-4 **Charles K. Chui**
University of Missouri & Stanford University

7-5 **Joseph Teran**
UCLA

7-6 **Hongkai Zhao**
UC-Irvine

#8. Nonlinear PDEs—*organizer*: Xu-Jia Wang, Australian National University

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PL **Xu-Jia Wang**
Australian National University

The Affine Maximal Surface Equation

In this talk, we consider the first boundary value problem of the affine maximal surface equation and, more generally, the affine Plateau problem. The affine maximal surface equation is the Euler equation of the affine volume functional. It is a fourth order nonlinear partial differential equation closely related to the Monge-Ampère equation. We formulate the first boundary value problem as a geometric variational problem and prove the existence of maximizers to the problem. To prove the regularity of the

maximizers, we establish the *a priori* estimates and prove that the maximizers can be approximated by smooth solutions. To prove the approximation, we employ a penalty argument, which requires us to solve the second boundary value problem. By a fundamental property of locally convex hypersurface, the above argument also leads to the existence and regularity of solutions to the affine Plateau problem.

8-1 **Juncheng Wei**
Chinese University of Hong Kong

On the De Giorgi Conjecture and Beyond

In 1978, De Giorgi conjectured the level set of bounded solution of Allen-Cahn equation

$$\Delta u + u - u^3 = 0 \text{ in } R^N$$

satisfying the monotonicity condition $\frac{\partial u}{\partial y_N} > 0$ must be hyperplanes, at least when $N \leq 8$.

Great progress has been made in the past 15 years. Positive answers are given: Ghousoub-Gui (N=2), Ambrosio-Cabre (N=3), and Savin (N=4,5,6,7,8) under a mild condition. In this talk, we give a counterexample in dimension N=9 by constructing a solution whose zero level set close to the Bombieri-De Giorgi-Giusti minimal graph. Furtheremore, we show that each embedded complete minimal surfaces in R^3 with finite total curvature corresponds to a solution of Allen-Cahn in R^3. Extension of the De Giorgi conjecture to stable or finite Morse index solutions will also be discussed. (Joint work with Manuel del Pino and M. Kowalczyk.)

8-2 **Bo Guan**
Ohio State University

8-3 **Hitoshi Ishii**
Waseda University

The Neumann problem for Hamilton-Jacobi equations in view of weak KAM

I will discuss a formula for the solutions of the Neumann problem for Hamilton-Jacobi equations. The discussion will be concerned with Aubry-Mather sets and optimal control of the associated Skorokhod problem, which the solution formula is based upon.

8-4 **Huaiyu Jian**
Tsinghua University

A Bernstein theorem for the Monge-Ampere equation and applications

This talk is based on a joint work with Professor Xu-Jia Wang. We first introduce a new transform for convex functions, then use it and a moving planes method to proves a Bernstein property for a Monge-Ampere equation in half space, and finally use the Bernstein property to prove the global regulariy of affine hyperbolic sphere.

8-5 **Yng-Ing Lee**
(National Taiwan University)

Self-similar solutions and translating solutions for Lagrangian mean curvature flow

8-6 **Yu Yuan**
University of Washington

#9. Number Theory—*organizer*: Brian Conrad, Stanford

PL **James Borger**
Australian National University

9-1 **Samit Dasgupta**
UC-Santa Cruz

9-2 **Cristian Popescu**
UC-San Diego

9-3 **James Borger**
Australian National University

9-4 **Karl Rubin**
UC-Irvine

Twists of elliptic curves and Hilbert's Tenth Problem

In joint work with Barry Mazur, we investigate the 2-Selmer rank in families of quadratic twists of elliptic curves over arbitrary number fields. We give sufficient conditions on an elliptic curve so that it has twists of arbitrary 2-Selmer rank, and we give lower bounds for the number of twists (with bounded conductor) that have a given *2*-Selmer rank. As a consequence, under appropriate hypotheses we can find many twists with Mordell-Weil rank zero, and (assuming the Shafarevich-Tate conjecture) many others with Mordell-Weil rank one. Using work of Poonen and Shlapentokh, it follows from our results that if the Shafarevich-Tate conjecture holds, then Hilbert's Tenth Problem has a negative answer over the ring of integers of every number field.

9-5 **Vinayak Vatsal**
University of British Columbia

9-6 **Akshay Venkatesh**
Stanford University

#10. Random Systems and PDEs—*organizer*: Fraydoun Rezakhanlou, UC-Berkeley

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PL **S.R.S. Varadhan**
Courant Institute

10-1 **Fraydoun Rezakhanlou**
UC-Berkeley

10-2 **Tadahisa Funaki**
University of Tokyo

Hydrodynamic limit for a dynamic model of 2D Young diagrams

We consider dynamics of two-dimensional Young diagrams by allowing the creation and annihilation of unit squares located at the boundary of the diagrams. The dynamics are naturally associated with the grandcanonical ensembles introduced by Vershik (’96), which are uniform measures under conditioning on their area. We show that, as the averaged area of the diagrams diverges, the corresponding height variable converges to a solution of

a certain non-linear partial differential equation under the hydrodynamic space-time scaling. The stationary solution of the limit equation is identified with the so-called "Vershik curve." We also discuss the conservative dynamics which have a connection to the surface diffusion, and give some remarks to the 3D case. This is a joint work with Makiko Sasada (University of Tokyo).

10-3 Atilla Yilmaz
UC-Berkeley

Large deviations for random walk in a random environment

I will talk about large deviations for nearest-neighbor random walk in an i.i.d. environment on $\mathbb{Z}^d$. There exist variational formulae for the quenched and the averaged rate functions I_q and I_a, obtained by Rosenbluth and Varadhan, respectively. I_q and I_a are not identically equal. However, when $d \geq 4$ and the walk satisfies the so-called (T) condition of Sznitman, they are equal on an open set A_{eq}. For every *xi* in A_{eq}, there exists a positive solution to a Laplace-like equation involving *xi* and the original transition kernel of the walk. This solution lets us define a new transition kernel via the h-transform technique of Doob. This new kernel corresponds to the unique minimizer of Varadhan's variational formula at *xi*. It also corresponds to the unique minimizer of Rosenbluth's variational formula provided that the latter is slightly modified. In other words, when the limiting average velocity of the walk is conditioned to be equal to *xi*, the walk chooses to tilt its original transition kernel by an *h*-transform.

10-4 Stefano Olla
CEREMADE

10-5 Sunder Sethuraman
Iowa State

A scaling limit for a tagged particle in bounded one dimensional zero-range systems

Zero-range processes follow a collection of random walks moving on a lattice which interact in terms of jump times in the following way: At a site with *k* particles, a clock rings with rate $g(k)$, and then one of the particles, chosen uniformly, displaces by *j* with probability $p(j)$. The behavior of the system, in particular the mixing properties, varies depending on the asymptotic growth of the rate *g*.

In this talk, we discuss a nonequilibrium scaling limit for a tagged, or distinguished particle in one dimensional mean-zero zero-range systems with bounded, increasing rates. Previously, in Jara-Landim-Sethuraman (2009), processes with at least linear rates are considered. A different approach is required for bounded rate systems.

10-6 Alejandro F. Ramírez
Pontificia Universidad Católica de Chile

Ballisticity conditions for random walk in random environment

We consider a random walk in a random environment on a uniformly elliptic i.i.d. environment in dimensions $d \geq 2$. It is conjectured that transience in a given direction implies ballisticity in the same direction. In this talk, we will discuss some progress on this question in terms of a class of ballisticity conditions introduced in 2002 by Sznitman.

This talk is based on joint works with Alexander Drewitz from TU Berlin.