SPA 2019 Scientific Program

Monday, July 8th

8:15 - 9:15 Registration, 2nd Floor Norris Center

9:15 - 9:30 Opening Remarks, McCormick Auditorium

9:30 - 10:30 Doob Lecture, McCormick Auditorium

Jeremy Quastel (University of Toronto, Canada)

Title: The KPZ fixed point

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Abstract: The one dimensional KPZ universality class contains random growth models, directed random polymers, stochastic Hamilton-Jacobi equations (e.g. the eponymous Kardar-Parisi-Zhang equation). It is characterized by unusual scale of fluctuations, some of which appeared earlier in random matrix theory, and which depend on the initial data. The explanation is that on large scales everything should approach a

special scaling invariant Markov process, the KPZ fixed point. It is obtained by solving one model in the class, TASEP, and passing to the limit. Both TASEP and the KPZ fixed point turn out to be completely integrable, and there are unexpected connections to dispersive PDE. (Joint work with Konstantin Matetski and Daniel Remenik).

10:30 - 11:00 Coffee Break

11:00 - 12:00 Plenary Talk, McCormick Auditorium

Caroline Uhler (MIT, USA)

Title: Your dreams may come true with MTP2
Abstract: We study probability distributions that are multivariate totally positive of order two (MTP2). Such distributions appear in various applications from ferromagnetism to Brownian motion tree models used in phylogenetics to factor analysis models used in finance. We first describe some of the intriguing properties of such distributions with respect to conditional independence and graphical models. In particular, we show that maximum likelihood estimation for MTP2 exponential families is a convex optimization problem and leads to sparsity of the underlying graph in quadratic exponential families (such as Gaussian or Ising models) without the need of a tuning parameter. We then consider the problem of non-parametric density estimation under MTP2, showing that the MLE is a piecewise linear function by developing new results in geometric combinatorics. We end with an application to covariance matrix estimation for portfolio selection.

2:45 - 3:45 Schramm Lecture, McCormick Auditorium

Stanislav Smirnov (Université de Genève and Skoltech, Switzerland, Russia)

Title: Percolation revisited
Abstract: We will discuss the state of our understanding of 2d percolation, and will present a recent joint work with Mikhail Khristoforov, giving a new proof of its conformal invariance at criticality.

3:45 - 4:15 Coffee break

4:15 - 6:00 Invited Sessions and Contributed Talks

Invited Session: Biomedical applications, McCormick Auditorium
Organized by Sebastien Roch (University of Wisconsin, USA)

4:15 - 4:45 Julia Palacios (Stanford University, USA)
Title: Tajima Coalescent
Abstract: In this talk I will present the Tajima coalescent, a model on the ancestral relationships of molecular samples. This model is then used as a prior model on unlabeled genealogies to infer evolutionary parameters with a Bayesian nonparametric method. I will then show that conditionally on observed data and a particular mutation model, the cardinality of the hidden state space of Tajima's genealogies is exponentially smaller than the cardinality of the hidden state space of Kingman's

genealogies. We estimate the corresponding cardinalities with sequential importance sampling. Finally, I will propose a new distance on unlabeled genealogies that allows us to compare different distributions on unlabeled genealogies to Tajima's coalescent.

4:50 - 5:20 Lea Popovic (Concordia University, Canada)
Title: Spatial effects in stochastic dynamics of gene regulation
Abstract: Regulation of gene expression includes a wide range of mechanisms that are used by cells to increase or decrease the production of gene products (protein or RNA). Mathematical models of gene regulation describe the inherently stochastic dynamics of the process. Spatial effects including inhomogeneity of the domain and compartmentalization of certain molecules contributes to a more diverse set of dynamical outcomes. We describe a detailed spatial stochastic model for intracellular reactions and molecular diffusion, in terms of a measure valued Markov process. We derive various asymptotic limits using the multi-scale nature of intracellular reactions and molecular amounts. We use these model reduction methods to decrease the simulation time and to simplify statistical calculations describing relevant dynamical features.

5:25 - 5:55 Rebecca Willett (University of Chicago, USA)
Title: Estimating network structure from incomplete event data
Abstract: Multivariate Bernoulli autoregressive (BAR) processes model time series of events in which the likelihood of current events is determined by the times and locations of past events. These processes can be used to model nonlinear dynamical systems, corresponding to criminal activity, responses of patients to different medical treatment plans, opinion dynamics across social networks, activations in biological neural networks, and more. Past work examines this problem under the assumption that the event data is complete, but in many cases, only a fraction of events are observed. Incomplete observations pose a significant challenge in this setting because the unobserved events still govern the underlying dynamical system. In this work, we develop a novel approach to estimating the parameters of a BAR process in the presence of unobserved events via an unbiased estimator of the complete data log-likelihood function. We propose a computationally efficient estimation algorithm which approximates this estimator via Taylor series truncation and establish theoretical results for both the statistical error and optimization error of our algorithm. We further justify our approach by testing our method on both simulated data and a real data set consisting of crimes recorded by the city of Chicago.

This is joint work with Benjamin Mark and Garvesh Raskutti.

Invited Session: Nodal structures of random and deterministic functions, Northwestern Room
Organized by Igor Wigman (King's College London, UK) and Dmitry Belyaev (University of Oxford).

4:15 - 4:45 Steve Zelditch (Northwestern University, USA)
Title: Equivariant random spherical harmonics on S^3 have just one nodal component and it is of near-maximal genus

Abstract: Computer graphics of Alex Barnett have shown that nodal sets
of random spherical harmonics of degree N on the 3-sphere S^3 are very
different from those on the 2-sphere S^2: only one giant component shows
up in the graphics (although Nazarov-Sodin show that there are N^3 components). Sarnak posed the problem of computing the expected genus
of the giant component and proposed that it has maximal order N^3. Junehyuk
Jung and I prove that these properties hold for real and imaginary parts of random equivariant spherical harmonics of degree N, namely spherical harmonics which transform by
$e^{im \theta}$ under standard circle action on S^3. For each $m \not= 0$,
this is an N-dimensional subspace of spherical harmonics in the N^2 dimensional space of all spherical harmonics. In fact, for $m \not=0$, the nodal set has just one component almost surely. Joint work with Junehyuk Jung.

4:50 - 5:20 Marie Kratz (ESSEC Business School, CREAR, France)
Title: On the regularity of functionals for stationary Gaussian processes
Abstract: We are interested in the order of Sobolev space D_2^{\alpha} of functionals of the type \int_0^1 \Lambda (X_{t},\dot{X}_{t}) dt where X is a centered Gaussian process satisfying some conditions, to be discussed, and \Lambda \in \mathscr{S}^{\prime} (\mathbb{R}^{2}). Applications to time occupation functionals are considered and examples with different correlation functions developed. This is a joint work with Takafumi Amaba.

5:25 - 5:55 Igor Wigman (King's College London, UK)
Title: Mean conservation of nodal volume and connectivity measures for Gaussian ensembles
Abstract: This talk is based on a joint work with D. Beliaev and S. Muirhead. We study in depth the nesting graph and volume distribution of the nodal domains of a Gaussian field, which have been shown in previous works to exhibit asymptotic laws. A striking link is established between the asymptotic mean connectivity of a nodal domain (i.e. the vertex degree in its nesting graph) and the positivity of the percolation probability of the field, along with a direct dependence of the average nodal volume on the percolation probability. Our results support the prevailing ansatz that the mean connectivity and volume of a nodal domain is conserved for generic random fields in dimension d=2 but not in d≥3, and are applied to a number of concrete motivating examples.

Invited Session: Fluctuations of interacting particle systems, Wildcat Room

Organized by Patrícia Gonçalves (IST-Lisbon, Portugal)

4:15 - 4:45 Otávio Menezes (IST-Lisbon, Portugal)
Title: Non-equilibrium fluctuations of interacting particle systems

Abstract: We obtain the large scale limit of the fluctuations around its hydrodynamic limit of the density of particles of a weakly asymmetric exclusion process in dimensions 3 and smaller. The proof is based upon a sharp estimate on the relative entropy of the law of the process with respect to product reference measures associated to the hydrodynamic limit profile, which holds in any dimension and is of independent interest. Joint work with Milton Jara

4:50 - 5:20 Nicolas Perkowksi (Humbold Univ. Berlin, Germany)
Title: Energy solutions to the stochastic Burgers equation with Dirichlet boundary

Abstract: We derive stochastic Burgers equations with different boundary conditions from weakly asymmetric exclusion processes in contact with reservoirs or with sinks. To achieve this, we work with Goncalves-Jara energy solutions and extend them to domains with boundaries. In my talk I will focus on the well-posedness theory of these equations, as well as on the behavior near the boundary and on links with other approaches to the same equations. Based on joint works with Tertuliano Franco, Patricia Goncalves and Marielle Simon.

5:25 - 5:55 Joe Chen (Colgate University, USA)
Title: Nonequilibrium fluctuations in the boundary-driven exclusion process on a resistance space

Abstract: A resistance space is a state space which is bounded in the effective resistance metric, *viz.* supports strongly recurrent diffusion. Examples include: the 1D interval, trees with polynomial volume growth, fractals, and random graphs arising from critical percolation. For concreteness, we work with the Sierpinski gasket with its 3 corner vertices as the boundary set. Consider the exclusion process on successive graph approximations of the Sierpinski gasket, and add to each boundary point a birth-and-death process (Glauber dynamics) with different fixed rates. I will present two results concerning the empirical density under the diffusive scaling limit: a large deviation principle (LDP) with a good rate function; and the scaling limit of the density fluctuation field. I expect analogous results to hold on many other resistance spaces, modulo technical conditions. The proofs rely upon random walk estimates, the use of the effective resistance metric, and the associated 1st- and 2nd-order calculus on resistance spaces.

Since the underlying state space need not possess translational invariance, we use the resistance metric to swap a particle-hole pair in a “sea of particles", and to implement coarse-graining in the exclusion process. This “moving particle lemma” is intimately connected to the octopus inequality of Caputo, Liggett, and Richthammer, which was key to the positive resolution of Aldous' spectral gap conjecture.

This talk is based on my own work (moving particle lemma, local ergodicity), as well as joint works with: Michael Hinz and Alexander Teplyaev (LDP); Chiara Franceschini, Patrícia Gonçalves, and Otávio Menezes (scaling limit of the fluctuation field).

Contributed Session: SPDE, Lake Room

Organized by Raluca Balan (University of Ottawa, Canada)

4:15 - 4:30 Le Chen (University of Nevada, USA)
Title: Nonlinear stochastic partial differential equations with fractional operators

4:30 - 4:45 Fei Pu (University of Utah, USA)

Title: Optimal lower bounds on hitting probabilities for stochastic heat equations in spatial dimension $k \geq 1$

4:50 - 5:05 Luis Quer-Saranyons (Universitat Autonoma de Barcelona, Spain)
Title: SPDEs with fractional noise in space: continuity in law with respect to the Hurst index

5:05 - 5:20 Guangqu Zheng (University of Kansas, USA)
Title: Gaussian fluctuation of spatial average of some SPDEs

Contributed Talks, Lake Room

5:25 - 5:40 Raluca Balan (University of Ottawa, Canada)
Title: Stable Levy motion with values in the Skorohod space: construction and approximation

5:40 - 5:55 Michael Choi (City University of Hong Kong, Hong Kong)
Title: Accelerated simulated annealing with fast cooling

Contributed Talks, Arch Room

4:15 - 4:30 Watthanan Jatuviriyapornchai (Mahidol University, Thailand)
Title: Coarsening dynamics in inclusion processes and duality

4:30 - 4:45 Vladimir Vinogradov (Ohio University, USA)
Title: On the law of the total progeny for some Galton-Watson processes

4:50 - 5:05 Francys Andrews de Souza (Unicamp, Brazil)
Title: Stochastic near-optimal controls for path-dependent systems and some applications

5:05 - 5:20 Chris Scullard (Lawrence Livermore National Laboratory, USA)
Title: The method of critical polynomials on supercomputers

5:25 - 5:40 Jie Yen Fan (Monash University, Australia)
Title: Age-and-type structured population model

5:40 - 5:55 Alexander Roitershtein (Texas A&M, USA)
Title: On ballistic deposition process on a strip

6:00 - 8:30 Reception, Deering Meadow

Tuesday, July 9th

8:30 - 10:10 Invited Sessions and Contributed Talks

Invited Session: Random Trees, Wildcat Room
Organized by Christina Goldschimdt (University of Oxford, UK)

8:30 - 9:00 David Croydon (RIMS, Japan)
Title: Quenched and averaged tails of the heat kernel of the two-dimensional uniform spanning tree
Abstract: I will describe ongoing joint work (with M. T. Barlow and T. Kumagai) in which a detailed investigation of the heat kernel associated with the two-dimensional uniform spanning tree is conducted. This demonstrates the occurrence of log-logarithmic fluctuations around the leading order polynomial behaviour for the on-diagonal part of the quenched heat kernel. Moreover, two-sided estimates are given for the averaged heat kernel. Notably, these demonstrate a discrepancy between the exponents that appear in the off-diagonal parts of the quenched and averaged versions of the heat kernel, and also yield precise asymptotics for the average distance travelled by the associated random walk. Finally, we derive various scaling limits for the heat kernel, the implications of which include enabling us to sharpen the known asymptotics regarding the on-diagonal part of the averaged heat kernel.

9:05 - 9:35 Cécille Mailler (University of Bath, UK)
Title: The monkey walk: a random walk with random reinforced relocations and fading memory
Abstract: In this joint work with Gerónimo Uribe-Bravo, we prove and extend results from the physics literature about a random walk with random reinforced relocations. The "walker" evolves in \mathbb Z^d or \mathbb R^d according to a Markov process, except at some random jump-times, where it chooses a time uniformly at random in its past, and instatnly jumps to the position it was at that random time. This walk is by definition non-Markovian, since the walker needs to remember all its past.
Under moment conditions on the inter-jump-times, and provided that the underlying Markov process verifies a distributional limit theorem, we show a distributional limit theorem for the position of the walker at large time. The proof relies on exploiting the branching structure of this random walk with random relocations; we are able to extend the model further by allowing the memory of the walker to decay with time.

9:40 - 10:10 Delphin Sénizergues (Paris 13, France)
Title: Asymptotic properties of weighted recursive trees
Abstract: Starting from a sequence of positive real numbers (w_n) which we call weights, we construct a tree in a recursive manner: at time 1, the tree has only one vertex. Then at any step n+1, we add a new vertex to the tree and we choose its parent at random among the already existing vertices, in such a way that the k-th vertex (in order of creation) is chosen with probability proportional to w_k.

This model generalises the well-known uniform recursive tree (URT) in the case of a constant sequence (w_n). In fact, it can also be shown that the trees constructed using affine preferential attachment can be described using this construction for a random sequence of weights (w_n).
This motivates the study of these sequences of growing trees for general behaviours of the sequence (w_n). We obtain the almost sure scaling limit of the height, profile and degrees in the tree as the number

of vertices tends to infinity.

Invited Session: Spin Glasses, Northwestern Room

Organized by Louis-Pierre Arguin (CUNY, USA)

8:30 - 9:00 Qiang Zeng (CUNY, USA)
Title: Properties of Parisi Measures

9:05 - 9:35 Michel Pain (ENS, France)
Title: Fluctuations of branching Brownian motion at criticality
Abstract: Branching Brownian motion is a particle system on the real line, where individuals move according to Brownian motion and reproduce randomly. It can be seen as a spin glass toy model with an exact hierarchical structure. In this talk, I will present some recent results obtained with Pascal Maillard, concerning universal 1-stable fluctuations appearing in the critical Gibbs measure of branching Brownian motion and, in particular, in the derivative martingale. Moreover, our method describes the typical behavior of particles responsible for these fluctuations and could lead to further developments.

9:40 - 10:10 Nicholas Cook (Stanford University, USA)
Title: Maximum of the characteristic polynomial for a random permutation matrix
Abstract: Most of random matrix theory concerns the behavior of eigenvalues in the limit as the size N of the matrix tends to infinity. One source of motivation is the universality phenomenon: that many point processes seemingly unrelated to matrices, such as zeros of the Riemann zeta function, behave like eigenvalues of random matrices. Recent work has moved beyond zeros of the characteristic polynomial to look at extreme values, which also show some universal behavior. In this talk I will consider the characteristic polynomial \chi_N(z) for a uniform random N\times N permutation matrix. Our main result is a law of large numbers for the maximum of \log|\chi_N| over the unit circle. As in other works on extremes of log-correlated fields, our approach is to uncover a multi-scale structure in the distribution of \chi_N and adapt a well-known second moment argument due to Bramson for the maximal displacement of Branching Brownian Motion. Unlike the analogous problem for Haar unitary matrices, the distribution of \chi_N(z) is sensitive to Diophantine properties of the argument of z. To deal with this we borrow tools from the Hardy--Littlewood circle method. Based on joint work with Ofer Zeitouni.

Invited Session: Long Term Memory and applications, Lake Room

Organized by Gennady Samorodnitsky (Cornell University, USA)

8:30 - 9:00 Liudas Giraitis (Queen Mary, UK)
Title: Estimation pitfalls when the noise is not i.i.d.
Abstract: This paper extends Whittle estimation to linear processes with a general stationary ergodic martingale difference noise \{\eta_t\}. We show that such estimation is valid for standard parametric times series models with smooth bounded spectral densities, e.g. ARMA models. Furthermore, we clarify the impact of the hidden dependence in the noise on such estimation. We show that although the asymptotic normality of the Whittle estimates may still hold, the presence of dependence in the noise impacts the limit variance. Hence, the standard errors and confidence intervals valid under i.i.d.\ noise may not be applicable and thus

require correction. The goal of this paper is to raise awareness to the impact of a non i.i.d. noise in applied work.

9:05 - 9:35 François Roueff (Paris Tech, France)
Title: Spectral estimation for long range dependent discrete time trawl Processes
Abstract: Discrete time trawl processes constitute a large class of time series parameterized by a trawl sequence and defined though a sequence of independent and identically distributed copies of a continuous time process called the seed process. They provide a general framework for modeling linear or non-linear long range dependent time series. We refer to [Doukhan, P., Jakubowski, A., Lopes, S., and Surgailis, D. (2016)] for examples and results on the asymptotic behavior of the sample mean in these contexts. Here we investigate the consistency of a pointwise spectral density estimator and of a broadband spectral density estimator
under very general conditions satisfied by various long range dependent discrete time trawlprocesses of interest. This is done in particular by introducing a weighted weak dependence index and a specific way to parameterize the spectral density, both of which can be of independent interest.

9:40 - 10:10 Gennady Samorodnitsky (Cornell University, USA)
Title: Extreme Value Theory for Long Range Dependent Stable Random Field
Abstract: We study the extremes for a class of a symmetric stable random fields
with long range dependence. We prove functional extremal theorems both in the space of sup measures and in the space of cadlag functions of several variables. The limits in both types of theorems are of a new kind, and only in a certain range of parameters these limits have the Fréchet distribution. (jointly with Zaoli Chen)

Contributed Session: Biological and Statistical Applications of Branching Processes, Arch Room

Organized by Anand Vidyashankar (George Mason University, USA)

8:30 - 8:45 Maroussia Bojkova (Sofia University, Bulgaria)
Title: Stochastic monotonicity and continuity of general epidemics with vaccination control

8:45 - 9:00 Cristina Gutierrez Pérez (Universidad de Extremadura, Spain)
Title: A multitype branching process for modeling a Y-linked pedigree with non-syndromic hearing impairment

9:05 - 9:20 Olivier Hyrien (ENS, France)
Title: A Stochastic Evolutionary Model of Affinity Maturation

9:20 - 9:35 Carmen Minuesa (Universidad de Extremadura, Spain)
Title: Approximate Bayesian computation in controlled branching processes: the role of summary statistics

Contributed Talks, Arch Room

9:40 - 9:55 Matthew Griffiths (King's College London, UK)
Title: Cylindrical Lévy processes and Lévy space-time white noises

9:55 - 10:10 Dan Daniel Erdmann-Pham (UC Berkeley, USA)
Title: Generalized Greenwood Statistics and their Application to Two-Sample Testing

Contributed Talks, Evans Room

8:30 - 8:45 Jure Vogrinic (University of Warwick, UK)
Title: Anomalous scaling of the Metropolis Adjusted Langevin Algorithm

8:45 - 9:00 Hao Ge (Peking University, China)
Title: Nonequilibrium thermodynamic functionals of diffusion processes under first-order and second-order averaging

9:05 - 9:20 Huijie Qiao (Southeast University, China)
Title: Effective Filtering for Multiscale Stochastic Dynamical Systems driven by Lévy processes

9:20 - 9:35 Matija Vidmar (University of Ljubljana, Slovenia)
Title: Observing a Lévy process up to a stopping time

9:40 - 9:55 Ziteng Cheng (Illinois Institute of Technology, USA)
Title: Wiener-Hopf Factorization for Time-Inhomogeneous Finite Markov Chains

9:55 - 10:10 Eunghyun Lee (Nazarbayev University, Kazakhstan)
Title: Determinantal formulas in the multi-species integrable particle models

10:15 -10:45 Coffee Break

10:45 - 12:25 Invited Sessions and Contributed Talks

Invited Session: Stochastic Dynamics, Wildcat Room
Organized by Jinqiao Duan (IIT, USA)

10:45 - 11:15 Konstantinos Spiliopoulos (Boston University, USA)
Title: Metastability and exit problems for systems of stochastic reaction-diffusion equations
Abstract: We develop a metastability theory for a class of stochastic reaction-diffusion equations exposed to small multiplicative noise. We consider the case where the unperturbed reaction-diffusion equation features multiple asymptotically stable equilibria. When the system is exposed to small stochastic perturbations, it is likely to stay near one equilibrium for a long period of time, but will eventually transition to the neighborhood of another equilibrium. We are interested in studying the exit time from the full domain of attraction (in a function space) surrounding an equilibrium and therefore do not assume that the domain of attraction features uniform attraction to the equilibrium. This means that the boundary of the domain of attraction is allowed to contain saddles and limit cycles. Our method of proof is purely infinite dimensional, i.e., we do not go through finite dimensional approximations. In addition, we address the multiplicative noise case and we do not impose gradient type of assumptions on the nonlinearity. We prove large deviations logarithmic asymptotics for the exit time and for the exit shape,

also characterizing the most probable set of shapes of solutions at the time of exit from the domain of attraction. Joint work with Michael Salins.

11:20 - 11:50 Changho Kim (UC Merced, USA)
Title: Characterization of non-local and non-Markovian nature in the dynamics of a molecular fluid
Abstract: It is well known that the probability distribution of a Brownian particle (i.e. Wiener process) obeys the simple diffusion equation (i.e. heat equation). However, in a molecular fluid system, the diffusion of a tracer molecule is neither local in space nor Markovian in time, resulting in a spatio-temporal convolution term in the diffusion equation. Using Mori-Zwanzig formalism, we derive the latter diffusion equation and compute the spatio-temporal memory function from molecular dynamics simulations. We also address how this approach can be extended to characterize the non-local and non-Markovian nature for the linearized hydrodynamics description of a molecular fluid.

11:55 - 12:25 Yong Chen (Zhejiang Sci-Tech University, China)
Title: Wave-breaking and moderate deviations of the stochastic Camassa-Holm with pure jump noise
Abstract: In this paper, the stochastic Camassa-Holm equation with pure jump noise in the Marcus form is considered. Firstly, the equation is derived by the stochastic variation method. Then, wave-breaking is shown to occur in expectation. Furthermore, the global existence is obtained under suitable initial conditions. Finally, a moderate deviation principle is proved by the regularized equation, the weak convergence method and an exponential equivalence of the probability measures.

Invited Session: Gaussian Free Field, Northwestern Room

Organized by Marek Biskup (UCLA, USA)

10:45 - 11:15 Alexander Drewitz (Universität zu Köln, Germany)
Title: Geometry of Gaussian free field sign clusters and random interlacements
Abstract: We consider two fundamental percolation models with strong qlong-range correlations: Level set percolation for the Gaussian free field (GFF) and percolation of the vacant set of random interlacements. Both models have been the subject of intensive research during the last decades. In this talk we focus on structural properties of the level set percolation of the GFF. In particular, we establish the non-triviality of a phase in which two infinite sign clusters dominate, and their complement only has small connected components. While the respective results are new for \Z^d as the underlying graph, we also cover more intricate geometries such as transient graphs with subdiffusive random walk behavior. As a consequence, we answer an open problem on the non-triviality of the phase transition of the vacant set of Random Interlacements on such geometries. This talk is based on joint works with A. Prévost (Universität zu Köln) and P.-F. Rodriguez (IHES).

11:20 - 11:50 Yoshihiro Abe (Chiba University, Japan)
Title: Exceptional points of two-dimensional random walks at multiples of the cover time
Abstract: The Discrete Gaussian Free Field (DGFF) has a close relationship with the local time of random walks via Dynkin-type Isomorphism. I will talk about the local time of the continuous-time simple random walk on a large finite subset of the two-dimensional lattice with the wired boundary condition. The run-time of the walk is parametrized by the local time at the “boundary vertex” and approximated by a

multiple of the cover time. The talk will focus on statistics of points where the local times are atypically large.
These points are intimately related to thick points for the DGFF. This talk is based on joint work with Marek Biskup (UCLA)

11:55 - 12:25 Santiago Saglietti (Technion Haifa, Israel)
Title: Weak convergence for the scaled cover time of the rooted binary tree
Abstract: We consider a continuous time random walk on the rooted binary tree of depth n with all transition rates equal to one and study its cover time, namely the time until all vertices of the tree have been visited. We prove that, normalized by 2^{n+1}n and then centered by (log2)n-log n, the cover time admits a weak limit as the depth of the tree tends to infinity. The limiting distribution is identified as that of a randomly shifted Gumbel random variable with rate one, where the shift is given by the sum of the limits of the derivative martingales associated with two negatively correlated discrete Gaussian free fields on the infinite version of the tree. The existence of the limit and its overall form were conjectured in the literature. Our approach is quite different from those taken in earlier works on this subject and relies in great part on a comparison with the extremal landscape of the discrete Gaussian free field. Joint work with Aser Cortines and Oren Louidor.

Invited Session: Branching Processes, Lake Room

Organized by Zenghu Li (Beijing Normal University, China)

10:45 - 11:15 Leif Döring (University of Mannheim, Germany)
Title: Boundary behaviour of stable jump-diffusions

10:20 - 11:50 Hui He (Beijing Normal University, China)
Title: TBA

11:55 - 12:25 Chunhua Ma (Nankai University, China)
Title: Coalescences in Continuous-State Branching Processes
Abstract: Consider a continuous-state branching population constructed as a flow of nested subordinators. Inverting the subordinators and reversing time give rise to a flow of coalescing Markov processes (with negative jumps) which correspond to the ancestral lineages of individuals in the current generation. The process of the ancestral lineage of a fixed individual is the Siegmund dual process of the continuous-state branching process. We study its semigroup, its long-term behavior and its generator. In order to follow the coalescences in the ancestral lineages and to describe the backward genealogy of the population, we define non-exchangeable Markovian coalescent processes obtained by sampling independent Poisson arrival times over the flow. These coalescent processes are called consecutive coalescents, as only consecutive blocks can merge. They are characterized in law by finite measures on \mathbb{N} which can be thought as the offspring distributions of some inhomogeneous immortal Galton-Watson processes forward in time. The talk is based on a joint work with Clément Foucar and Bastien Mallein.

Contributed Talks, Arch Room

10:45 - 11:00: Omer Bobrowski (Technion, Israel)

Title: Homological Connectivity in Random Čech Complexes

11:00 - 11:15: Stefan Koch (Manheim University, Germany)
Title: Smooth dependence of fractional Brownian motion on its Hurst parameter and the limits of rough paths theory

11:20 - 11:35: Louis Fan (Indiana University, USA)
Title: Joint distribution of Busemann functions in the corner growth model

11:35 - 11:50: Wai-Kit Lam (University of Minnesota, USA)
Title: Universality for the time constant in 2D critical first-passage percolation

11:55 - 12:10: Alexander Schnurr (Universität Siegen, Germany)
Title: On Markov Processes with Killing and Semimartingales with Four Characteristics

12:10 - 12:25: Jeff Kuan (Texas A&M, USA)
Title: Markov duality and the KPZ equation

Contributed Talks, Evans Room

10:45 - 11:00: May-Ru Chen (National Sun Yat-sen University, Taiwan)
Title: On the cover times of the reflected-walk and the reflected Brownian motion

11:00 - 11:15: Waisur Khuda Bukhsh (The Ohio State University, USA)
Title: A Functional Central Limit Theorem for Susceptible-Infected (SI) Process on Configuration Model Graphs

11:20 - 11:35: Martina Favero (KTH Royal Institute of Technology, Sweden)
Title: A dual process for the coupled Wright-Fisher diffusion

11:35 - 11:50: Christian Tsai (National Taiwan University, Taiwan)
Title: On memory effect of sediment particle movement in turbulent flows by a random time interval Brownian motion model

11:55 - 12:10: Dong Yao (Duke University, USA)
Title: The symbiotic contact process

12:10 - 12:25: Julia Gaudio (MIT, USA)
Title: Attracting Random Walks

2:00 - 3:45 Invited Sessions and Contributed Talks

Invited Session: Potential Theory, Wildcat Room
Organized by Panki Kim (Seoul National University, South Korea)

2:00 - 2:30 Moritz Kassmann (Bielefeld University, Germany)
Title: Heat kernel bounds for symmetric Markov processes with singular jump measures

Abstract: In the Euclidean space R^d, we study symmetric Markov jump processes that correspond to nonlocal Dirichlet forms with singular mea- sures. The model example that we have in mind is given by a process $Z = (Z^1, \ldots, Z^d)$ of d independent symmetric one-dimensional stable processes. We consider Dirichlet forms that generate pure jump pro- cess X whose jump intensity is comparable to the one of Z. The aim of this talk is to prove sharp upper and lower heat kernel bounds for X in terms of the heat kernel of Z. Finally, we present a conjecture on heat kernel bounds for a general class of symmetric Markov jump processes.

2:35 - 3:05 Tadeusz Kulczycki (Wroclaw University of Science and Technology, Poland)
Title: Strong Feller property for SDEs driven by multiplicative cylindrical Lévy noise
Abstract: We study the stochastic differential equation dX_t = A(X_{t-}) \, dZ_t, X_0 = x, driven by cylindrical Lévy process Z_t in \R^d. Z_t = (Z_t^{(1)},\ldots,Z_t^{(d)})^T, where Z_t^{(1)}, \ldots, Z_t^{(d)} are independent one-dimensional L{\'e}vy processes with characteristic exponents \psi_1, \ldots, \psi_d. We assume that each \psi_i satisfies a weak lower scaling condition WLSC(\alpha,0,\underline{C}), a weak upper scaling condition WUSC(\beta,\theta_0,\overline{C}) (where 0< \alpha \le \beta < 2) and some additional regularity properties. We consider two mutually exclusive assumptions: either (i) all \psi_1, \ldots, \psi_d are the same and \alpha, \beta are arbitrary, or (ii) not all \psi_1, \ldots, \psi_d are the same and \alpha > (2/3)\beta. We also assume that the determinant of A(x) = (a_{ij}(x)) is bounded away from zero, and a_{ij}(x) are bounded and Lipschitz continuous. In both cases (i) and (ii) we prove that for any fixed \gamma \in (0,\alpha) the semigroup P_t of the process X_t satisfies |P_t f(x) - P_t f(y)| \le c t^{-\gamma/\alpha} |x - y|^{\gamma} ||f||_\infty for arbitrary bounded Borel function f. We also show the existence of a transition density of the process X_t.

3:10 - 3:40 Renming Song (University of Illinois at Urbana-Champaign, USA)
Title: Factorizations and estimates of Dirichlet heat kernels for non-local operators with critical killings
Abstract: In this talk I will discuss heat kernel estimates for critical perturbations of non-local operators. To be more precise, let X be the reflected \alpha-stable process in the closure of a smooth open set D, and X^D the process killed upon exiting D. We consider potentials of the form \kappa(x)=C\delta_D(x)^{-\alpha} with positive C and the corresponding Feynman-Kac semigroups. Such potentials do not belong to the Kato class. We obtain sharp two-sided estimates for the heat kernel of the perturbed semigroups. The interior estimates of the
heat kernels have the usual \alpha-stable form, while the boundary decay is of the form \delta_D(x)^p with non-negative p\in [\alpha-1, \alpha) depending on the precise value of the constant C. Our result recovers the heat kernel estimates of both the censored and the killed stable process in D.
Analogous estimates are obtained for the heat kernel of the Feynman-Kac semigroup of the \alpha-stable process in {\mathbf R}^d\setminus \{0\} through the potential C|x|^{-\alpha}.
All estimates are derived from a more general result described as follows: Let X be a Hunt process on a locally compact separable metric space in a strong duality with \widehat{X}. Assume that transition densities of X and \widehat{X} are comparable to the function \widetilde{q}(t,x,y) defined in terms of the volume of balls and a certain scaling function.
For an open set D consider the killed process X^D, and a critical smooth measure on D with the corresponding positive additive functional (A_t). We show that the heat kernel of the the Feynman-Kac semigroup of X^D through the multiplicative functional \exp(-A_t) admits the factorization of the form {\mathbf P}_x(\zeta >t)\widehat{\mathbf P}_y(\widehat{\zeta}>t)\widetilde{q}(t,x,y).

Invited Session: Percolation, Northwestern Room

Organized by Vincent Tassion (ETHZ, Switzerland)

2:00 - 2:30 Michael Damron (Georgia Tech, USA)
Title: Absence of backward infinite paths in first-passage percolation in arbitrary dimension
Abstract: In first-passage percolation (FPP), one places weights (t_e) on the edges of Z^d and considers the induced metric. Optimizing paths for this metric are called geodesics, and infinite geodesics are infinite paths all whose finite subpaths are geodesics. It is a major open problem to show that in two dimensions, with i.i.d. continuous weights, there are no bigeodesics (doubly-infinite geodesics). In this talk, I will describe work on bigeodesics in arbitrary dimension using ``geodesic graph'' measures introduced in '13 in joint work with J. Hanson. Our main result is that these measures are supported on graphs with no doubly-infinite paths, and this implies that bigeodesics cannot be constructed in a translation-invariant manner in any dimension as limits of point-to-hyperplane geodesics. Because all previous works on bigeodesics were for two dimensions and heavily used planarity and coalescence, we must develop new tools based on the mass transport principle. Joint with G. Brito (Georgia Tech) and J. Hanson (CUNY).

2:35 - 3:05 Sébastien Martineau (ENS - Lyon, France)
Title: Strict monotonicity of percolation thresholds under covering maps
Abstract: How does the critical parameter of percolation depend on the graph under consideration? Several theorems and conjectures attempt to shed qualitative light on this question, and I will present a recent result fitting this paradigm. If some transitive graph H is a strict quotient of a transitive graph G, then p_c(G)<1 \implies p_c(H)>p_c(G). We also obtain the same result for the uniqueness parameter p_u instead of p_c, under the additional assumption that the quotient map has bounded fibres. This is joint work with Franco Severo.

3:10 - 3:40 Subhajit Goswami (Institut des Hautes Études Scientifiques, France)
Title: Equality of critical parameters for GFF level-set percolation
Abstract: In this talk we will look at the level-sets of the Gaussian free field (GFF) on hypercubic lattice in dimensions 3 and higher above a given height parameter h. As h varies, this defines a canonical percolation model with strong, algebraically decaying correlations. Our main result is that three natural critical parameters associated with this model, respectively describing a well-ordered subcritical phase, the emergence of an infinite cluster, and the onset of a local uniqueness regime in the supercritical phase, actually coincide. In combination with previous results, our findings have many implications regarding our understanding of the level-set geometry of GFF, both in the sub- and supercritical regime. Based on a joint work with Hugo Duminil-Copin, Pierre-Francois Rodriguez and Franco Severo.

Invited Session: Stochastic Homogenization, Lake Room

Organized by Felix Otto (Max-Planck, Germany)

2:00 - 2:30 Charles Smart (University of Chicago, USA)
Title: Unique continuation and localization on the planar lattice
Abstract: I will discuss joint work with Jian Ding. We consider a Hamiltonian given by the Laplacian plus a Bernoulli potential on the two dimensional lattice. We prove that, for energies sufficiently close to the

edge of the spectrum, the resolvent on a large square is likely to decay exponentially. This implies almost sure Anderson localization for energies sufficiently close to the edge of the spectrum. Our proof follows the program of Bourgain--Kenig, using a new unique continuation result inspired by a Liouville theorem of Buhovsky--Logunov--Malinnikova--Sodin.

2:35 - 3:05 Pierre-Francois Rodriguez (ENS - Lyon, France)
Title: Random walk on dynamical percolation clusters
Abstract: We will discuss recent progress on invariance principles for random walks among dynamical random conductances, which are assumed bounded (say by one) but otherwise just jointly ergodic with respect to space-time shifts. Importantly, the conductances are allowed to vanish for non-trivial intervals of time so the walk may be stuck in small regions for long periods of time. We will sketch the proof of convergence of this walk to a non-degenerate Brownian motion under diffusive scaling of space and time based only on the assumption that the time to accumulate unit conductance on a given edge has sufficiently high moments. In particular, this proves Brownian scaling for random walks in a class of dynamical percolation models. Based on joint work with Marek Biskup.

3:10 - 3:40 Martin Slowik (Technische Universität Berlin, Germany)
Title: Green kernel asymptotics for two-dimensional random walks among random conductances
Abstract: The random conductance model is a well-established model for a random walk in random environment. In recent years the behaviour of the associated heat kernel and Green function has been intensively studied, and in dimension $d \geq 3$ the asymptotics of the Green kernel are meanwhile quite well-understood. In this talk, I present precise asymptotics of the potential kernel and the Green function of the random walk killed upon exiting balls in dimension $d=2$. This result holds, for instance, in the case of uniformly elliptic conductances, random walks on supercritical percolation clusters or ergodic degenerate conductances satisfying certain moment conditions. This talk is based on a joint work with Sebastian Andres (U Cambridge) and Jean-Dominique Deuschel.

Contributed Session: Stochastic Population Models, Arch Room

Organized by Jason Schweinsberg (UC San Diego, USA)

2:00 - 2:15 Maite Wilke Berenguer (Ruhr-Universität Bochum, Germany)
Title: Simultaneous migration in the seed bank coalescent

2:15 - 2:30 Sebastien Roch (University of Wisconsin, USA)
Title: Inferring the multispecies coalescent from average internode distances: some rigorous results

2:35 - 2:50 Verónica Miró Pina (UNAM, Mexico)
Title: The symmetric coalescent and Wright-Fisher models with bottlenecks

2:50 - 3:05 Dang Nguyen (University of Alabama, USA)
Title: Persistence and Extinction in Random Environments

Contributed Talks, Arch Room

3:10 - 3:25 Jason Schweinsberg (UC San Diego, USA)
Title: The nested Kingman coalescent: speed of coming down from infinity

3:25 - 3:40 Laurence Field (Australian National University, Australia)
Title: Length-biasing, pinning and unpinning for SLE

Contributed Talks, Evans Room

2:00 - 2:15 Sangjoon Lee (University of Connecticut, USA)
Title: Quasi-Limiting Behavior of a Drifted Brownian Process

2:15 - 2:30 Adrian Falkowski (Nicolaus Copernicus University, Poland)
Title: BSDEs with two barriers and generalized reflection

2:35 - 2:50 Jacek Malecki (Politechnika Wrocławska, Poland)
Title: Universality classes for general random matrix flows

2:50 - 3:05 Ma Elena Hernández-Hernández (University of Warwick, UK)
Title: Stochastic Optimal Control in Continuous time for general jump processes

3:10 - 3:25 Shota Osada (Kyushu University, Japan)
Title: Isomorphisms between determinantal point processes and Poisson point processes

3:25 - 3:40 Airam Blancas (Stanford University, USA)
Title: A general mulitispecies coalescent model of neutral evolution

3:45 - 4:15 Coffee Break

4:15 - 6:10 Invited Sessions and Contributed Talks

Invited Session Rough Paths, Wildcat Room
Organized by Mathieu Rosenbaum (Ecole Polytechnique, France)

4:15 - 4:45 Christa Cuchiero (Vienna University, Austria)
Title: Existence and stability for stochastic Volterra equations with jumps
Abstract: We provide a general weak existence and stability result for stochastic convolution equations with jumps under mild regularity assumptions allowing for non-Lipschitz coefficients and singular kernels. Our key ingredient relies on an original reformulation of the stochastic convolution equation as a martingale problem in Lp–spaces, leading to generic approximation and stability results in spirit of the classical Feller and martingale problem theory. We also shed light on path regularity using certain moment estimates and Sobolev embedding theorems. The talk is based on joint work with E. Abi Jaber, M. Larsson and S. Pulido.

4:50 - 5:20 Rama Cont (University of Oxford)
Title: Pathwise calculus for processes with irregular trajectories
Abstract: In his seminal paper Calcul d'Ito sans probabilités (1981), Hans Föllmer showed that the Ito formula holds pathwise for functions paths with finite quadratic

variation along a sequence of partitions. Building on Föllmer's insight, we construct a pathwise calculus for smooth functionals of continuous paths with finite
p-th variation along a sequence of time partitions, for arbitrary large p>0. We
construct a pathwise integral, defined as a pointwise limit of compensated Riemann sums, which satisfies a change of variable formula and an isometry formula.
Results for functions are extended to path-dependent functionals using a
concept of functional derivative introduced by Dupire. As a result we obtain a
unique "signal plus noise" decomposition for regular functionals of paths with
strictly increasing p-th variation. Our results apply to sample paths of semimartingales
as well as fractional Brownian motion with arbitrary Hurst parameter H>0 and other rough processes.
We show that the robustness of this construction with respect to
the choice of the partition is linked to a roughness property of the underlying paths.

5:25 - 5:50 Mathieu Rosenbaum (Ecole Polytechnique, France)
Title: From quadratic Hawkes processes to rough volatility and Zumbach effect
Abstract:
It is now well-accepted in quantitative finance that volatility is rough. We show in this talk that this universal phenomenon can be
explained through a suitable modeling of market microstructure with Hawkes processes. These processes enable us
to encode accurately the stylized facts of high frequency financial markets and lead in the long run to a rough behavior of the volatility.
We particularly focus on quadratic Hawkes processes in order to be also able to explain the time reversal asymmetry, often called Zumbach effect, observed on financial time series.
The talk is based on joint work with A. Dandapani and P. Jusselin.

Invited Session: SLE, Northwestern Room

Organized by Fredrik Viklund (KTH, Sweden)

4:15 - 4:45 Eveliina Peltola (Université de Genève, Switzerland)
Title: Crossing probabilities of multiple Ising interfaces
Abstract: I discuss crossing probabilities of multiple interfaces in the critical
Ising model with alternating boundary conditions. In the scaling limit, they are conformally invariant expressions given by so-called pure partition functions of multiple SLE(kappa) with kappa=3. I also describe analogous results for critical percolation and the Gaussian free field.
This is joint work with Hao Wu (Yau Center / Tsinghua University).

4:50 - 5:20 Xin Sun (Columbia University, USA)
Title: Conformal embedding and percolation on the uniform triangulation
Abstract:
Following Smirnov's proof of Cardy's formula and Schramm's discovery of SLE, a thorough understanding of the scaling limit of critical percolation on the regular triangular lattice has been achieved. Smirnorv's proof in fact gives a discrete approximation of the conformal embedding which we call the Cardy embedding. In this talk I will present a joint project with Nina Holden where we show that the uniform triangulation under the Cardy embedding converges to the Brownian disk under the conformal embedding. Moreover, we prove a quenched scaling limit result for the critical percolation on uniform

triangulations. Time permitting, I will also explain how this result fits into the larger picture of random planar maps and Liouville quantum gravity.

5:25 - 5:50 Dapeng Zhan (Michigan State, USA)
Title: Time-reversal of Multiple-force-point SLE_\kappa(\underline\rho) with All Force Points Lying on the Same Side
Abstract: We define intermediate SLE_\kappa(\underline) and reversed intermediate SLE_\kappa(\underline) processes using Appell-Lauricella multiple hypergeometric functions, and use them to describe the time-reversal of multiple-force-point chordal SLE_\kappa(\underline \rho) curves in the case that all force points are on the boundary and lie on the same side of the initial point, and \kappa and \underline \rho=(\rho_1,\dots,\rho_m) satisfy that either \kappa\in(0,4] and \sum_{j=1}^k \rho_j>-2 for all 1\le k\le m, or \kappa\in(4,8) and \sum_{j=1}^k \rho_j\ge \frac{\kappa}{2}-2 for all 1\le k\le m.

Contributed Session: Inference for stochastic processes, Lake Room

Organized by Soukaina Doussi (University Cadi Ayyad, Morocco)

4:15 - 4:30 Igor Cialenco (Illinois Institute of Technology, USA)
Title: Statistical inference problems for discretely sampled SPDEs

4:30 - 4:45 Konstantinos Spillopoulos (Boston University, USA)
Title: Statistical Inference for Continuously- And Discretely-Observed Multiscale Diffusion Processes

4:50 - 5:05 Soukaina Douissi (University Cadi Ayyad, Morocco)
Title: Berry Esséen bound for mean-reversion estimator of an AR(1) process driven by a second chaos white noise

5:05 - 5:20 Fatimah Alshahrani (Michigan State University)
Title: Modeling Atlantic sea level rise as an AR(1) process with Gumbel innovations

Contributed Talks, Lake Room

5:25 - 5:40 Nathaniel Eldredge (University of Northern Colorado, USA)
Title: Uniform heat kernel estimates for left-invariant Brownian motion on Lie groups via uniform doubling

5:40 - 5:55 Jorg-Uwe Lobus (Martin-Luther-University Halle-Wittenberg, Germany, and University of Linkoping, Sweden)
Title: Infinite dimensional Ornstein-Uhlenbeck processes with unbounded diffusion – quadratic variation, Itô formula, and generalizations

5:40 - 5:55 Guodong Pang (Penn State University)
Title: Generalized fractional Brownian motion as scaling limits of non-stationary shot noise processes

Contributed Session: Interacting systems in statistical mechanics, Arch Room

Organized by Benedikt Jahnel (WIAS, Germany) and Christof Külske (Ruhr Universität, Germany)

4:15 - 4:30 Pierre Houdebert (Universität Potsdam, Germany)
Title: Sharp phase transition for the Area-interaction and Widom-Rowlinson model

4:30 - 4:45 Arnaud Le Ny (Université Paris-Est, France)
Title: Random b.c. for long-range Dyson-Ising models

4:50 - 5:05 Christof Külske (Ruhr Universität, Germany)
Title: Time-evolved Widom-Rowlinson models in discrete geometries: hardcore vs softcore

5:05 - 5:20 Benedikt Jahnel (WIAS, Germany)
Title: Dynamical Gibbs-non-Gibbs transitions for the continuum Widom-Rowlinson model

Contributed Talks, Arch Room

5:25 - 5:40 Nobuaki Naganuma (Osaka University, Japan)
Title: Asymptotic expansion of the density for hypoelliptic rough differential equation

5:40 - 5:55 Praveen Kolli (Carnegie Mellon, USA)
Title: Large rank-based models with common noise

5:55 - 6:10 Hugo de la Cruz (EMAp/FGV, Brazil)
Title: A Random Differential Equation-based method for the pathwise simulation of the Stochastic Transport Equation

Contributed Talks, Evans Room

4:15 - 4:30 Matthieu Simon (The University of Melbourne, Australia)
Title: SIR epidemics with stochastic infectious periods

4:30 - 4:45 Mateusz Topolewski (Nicolaus Copernicus University, Poland)
Title: Systems of BSDEs with oblique reflection and related optimal switching problems

4:50 - 5:05 David Stenlund (Åbo Akademi University, Finland)
Title: Moments of Occupation Times for One-dimensional Diffusions

5:05 - 5:20 David Barrera (École Polytechnique, France)
Title: Generalization bounds for least-squares regression over independent samples

5:25 - 5:40 Zhang Na (University of Cincinnati, USA)
Title: Quenched Central Limit Theorem (CLT) for Random Fields

5:40 - 5:55 Lucas Reding (Université de Rouen Normandie, France)
Title: On kernel regression estimation for random fields

5:55 - 6:10 James Thompson (University of Luxembourg, Luxembourg)
Title: Functional inequalities for Feynman-Kac semigroups

Wednesday, July 10th

8:30 - 9:30 Plenary Lecture, McCormick Auditorium

Béatrice de Tilière (Université Dauphine, France)

Title: The Z-invariant Ising model via dimers & outlook
Abstract: The Z-invariant Ising model is a version of the 2d-Ising model introduced by Baxter: the model is defined on an isoradially embedded graph, and the coupling constants satisfy the Yang-Baxter equations; the "classical" Ising models on the square, triangular or honeycomb lattice are specific examples of the above. The coupling constants are explicit, and depend on an elliptic parameter k playing the role of the temperature; in the specific case where k=0, the Ising model is critical.
In the first part of the talk we will define the model, and explain how it can be studied using the dimer model. Next we will state results obtained in collaboration with Cédric Boutillier (Sorbonne university) and Kilian Raschel (Tours): we prove an explicit expression for the Gibbs measure which has the remarkable property of only depending on the local geometry of the graph, we obtain an explicit expression for the free energy having the same locality property; then we establish that the model undergoes an order two phase transition at k=0, and that this phase transition is the same as that of the rooted spanning forests model.
It turns out that the dimer model arising from the Z-invariant Ising model is a specific case of a more general family of elliptic dimer models whose weights have been introduced by Fock. In the last part of the talk, we will briefly mention ongoing work on these more general dimer models; this is based on work in progress with Cédric Boutillier and David Cimasoni (Genève).

9:30 - 10:30 Plenary Lecture, McCormick Auditorium

Dmitry Panchenko (University of Toronto, Canada)

Title: Synchronization mechanism in spin glasses
Abstract: I will describe some ideas behind the Parisi formula for the free energy in the Sherrington-Kirkpatrick model of spin glasses and explain how these ideas can be extended to compute the free energy in two versions of the model: (a) with non-homogeneous interactions and (b) with vector spins, for example, in the Potts spin glass.

10:30 - 11:00 Coffee Break

11:00 - 12:00 Medallion Lecture, McCormick Auditorium

Krzysztof Burdzy (University of Washington)

Title: On Archimedes' principle and Fermi acceleration
Abstract: I will describe an approach to Archimedes' principle using classical mechanics, mixed with some stochastic ideas. "Fermi acceleration" refers to the unlimited growth of energy in models for particles reflecting from moving walls. I will discuss the question of the emergence of Fermi acceleration in rotating drums with hard balls under gravitation. Joint work with M. Duarte, C.E. Gauthier, R. Graham, J. Malecki

and J. San Martin.

Thursday, July 11th

8:30 - 9:30 Plenary Lecture, McCormick Auditorium

James R. Lee (University of Washington)

Title: Unimodular uniformization and random walks

Abstract: Consider deforming the path metric of a unimodular random graph by a (unimodular) reweighting of its vertices. In many instances, a well-chosen change of metric can can be used to study the spectral measure, estimate the heat kernel, and bound the speed of the walk. The method applies in general settings; for instance, it shows that a unimodular random graph that is sphere-packed in d-space has spectral dimension at most d. But it is also useful even for extensively studied models like the uniform infinite planar triangulation and critical percolation on the 2D integer lattice, where this approach resolves open questions that do not seem amenable to known methods.

9:30 - 10:30 Plenary Lecture, McCormick Auditorium

Allan Sly (Princeton University)

Title: The slow bond model with small perturbations
Abstract: The slow bond model is the totally asymmetric simple exclusion process (TASEP) in which particles cross the edge at the origin at rate 1 - \epsilon rather than at rate 1. Janowsky and Lebowitz asked if there was a global slowdown in the current for all \epsilon>0. Using a range of theory and simulations two groups of physicists came to opposing conclusions on this question. With Basu and Sidoravicius this was settled, establishing that there is a slowdown for any positive \epsilon. In the current work we illuminate the reason this problem was difficult to resolve using simulations, by analyzing the effect of the perturbation as \epsilon \to 0 and showing it decays faster than any polynomial.

10:30 -11:00 Coffee Break

11:00 - 12:00 Medallion Lecture, McCormick Auditorium

Etienne Pardoux (Aix-Marseille Université, France)

Title: Fluctuations around a law of large numbers and extinction of an endemic disease

Abstract: We consider epidemic models where the is a constant flux of susceptibles, either because no immunity or loss of immunity after some time, or by demographic effects. Under certain conditions on the parameters, the associated deterministic epidemic model, which is an ODE, has a stable endemic equilibrium. This ODE is a large population law of large numbers limit of a system of stochastic Poisson driven SDEs. The stochastic model has a disease free absorbing state, which by irreducibility, is reached soon or later by the process. It might however be that the time it takes for this to happen is enormous. It is therefore of interest to try to predict the time it takes for the random fluctuations inherent in the model to drive the system to the disease free absorbing state. This can be done using the central limit theorem, moderate and large deviations. The relevance of each approach will depend upon the size of

the population.
Most results are given for an homogeneous model (i.e. where each infectious is likely to infect equally likely each susceptible in the population). We shall discuss possible extensions to a population distributed over space, and to the so--called ``household model'', where there are both local infections in each household, and global infections between the households. In that model, the law of large numbers limit is given by a type of ``propagation of chaos'' result.
This is joint work with R. Forien, P. Kratz, B. Samegni--Kepgnou and T. Yeo.

2:45 - 3:45 Doeblin Prize Lecture, McCormick Auditorium

Jason Miller (University of Cambridge)

Title: Existence and uniqueness of the Liouville quantum gravity metric for \gamma \in (0,2)
Abstract: Liouville quantum gravity (LQG) is in some sense the canonical model of a two-dimensional Riemannian manifold and is defined using the (formal) metric tensor
\[e^{\gamma h(z)} (dx^2 + dy^2)\]
where h is an instance of some form of the Gaussian free field and \gamma \in (0,2) is a parameter. This expression does not make literal sense since h is a distribution and not a function, so cannot be exponentiated. Previously, the associated metric (distance function) was constructed only in the special case \gamma=\sqrt{8/3} in joint work with Sheffield. In this talk, we will show how to associate with LQG a canonical conformally covariant metric for all \gamma \in (0,2). It is obtained as a limit of certain approximations which were recently shown to be tight by Ding, Dub\'edat, Dunlap and Falconet. Based on joint work with Ewain Gwynne.

3:45 - 4:15 Coffee break

4:15 - 6:00 Invited Sessions and Contributed Talks

Invited Session: Random Walks, Location: McCormick Auditorium
Organized by Assaf Nachmias (Tel Aviv University, Israel)

4:15 - 4:45 Ewain Gwynne (University of Cambridge, UK)
Title: Random walk on random planar maps via Liouville quantum gravity
Abstract: We discuss a general approach for analyzing certain random planar maps --- including the uniform infinite planar triangulation (UIPT) and random planar maps sampled with probability proportional to the number of spanning trees, bipolar orientations, or Schnyder woods they admit.

Using our approach, we prove that random walk on the UIPT typically travels graph distance $n^{1/4 + o(1)}$ in n units of time, as conjectured by Benjamini and Curien (2013).
More generally, for a class random planar maps, we prove that the random walk typically travels graph distance $n^{1/d + o(1)}$ in n units of time, where d is the graph distance ball volume exponent.
We also show that the spectral dimension for each of these random planar maps is a.s. equal to 2 --- i.e., the return probability to the starting point after n steps is $n^{-1+o(1)}$.

Our approach is based on a strong coupling of each of the maps under consideration with SLE-decorated Liouville quantum gravity (LQG), which arises from mating-of-trees theory.
This coupling allows us to deduce estimates for random planar maps from estimates for SLE and LQG.

Based on joint works with Jian Ding, Nina Holden, Tom Hutchcroft, Jason Miller, and Xin Sun.

4:50 - 5:20 Jonathan Hermon (University of Cambridge, UK)
Title: Anchored expansion in supercritical percolation on nonamenable graphs
Abstract: Let G be a transitive nonamenable graph, and consider supercritical Bernoulli bond percolation on G. We prove that the probability that the origin lies in a finite cluster of size n decays exponentially in n. We deduce that:

1. Every infinite cluster has anchored expansion almost surely. This answers positively a question of Benjamini, Lyons, and Schramm (1997).

2. Various observables, including the percolation probability and the truncated susceptibility are analytic functions of p throughout the entire supercritical phase.

Joint work with Tom Hutchcroft.

5:25 - 5:55 Shirshendu Ganguly (University of Chicago, USA)
Title: Diffusive estimates for random walk under annealed polynomial growth
Abstract: We show that on a random infinite graph G of annealed polynomial growth where simple random walk is stationary, it is diffusive along a subsequence of times. This extends a result of Kesten that applied to the extrinsic metric on subgraphs of the lattice Z^d , and answers a question due to Benjamini, Duminil-Copin, Kozma and Yadin, combined with whose work, it follows that harmonic functions of sub-linear growth on such graphs are constants. We also show that, in general, passing to a subsequence of times is necessary. Based on work with James Lee and Yuval Peres.
shmuel

Invited Session: Random Topology, Northwestern Room
Organized by Omer Bobrowski

4:15 - 4:45 Shmuel Weinberger (University of Chicago)
Title: Random embeddings of manifolds
Abstract: There are various ways of getting random embeddings. Perhaps the simplest is using a large set of Gaussian random functions. I will describe work with R.Adler, S.Krishnan, and J.Taylor about these. I will also describe work with a quite different motivation with F.Manin that uses a construction of L.Guth and M.Gromov to produce embeddings of Riemannian manifolds that have proved useful in quantitative cobordism theory and I hope will be valuable elsewhere.

4:50 - 5:20 Takashi Owada (Purdue University, USA)
Title: Limit theorems for topological invariants of dynamic multi-parameter simplicial complex
Abstract: We consider a multi-parameter simplicial complex as a higher-dimensional generalization of the Erdos-Renyi graph. In particular, we formulate the ``dynamic" version of the multi-parameter simplicial complex, where the temporal evolution of simplicies of various dimensions is determined by stationary on/off processes with renewal structure. The dynamic versions of the clique complex and the Linial-Meshulum complex are included as a special case. Our primary goal is to establish the functional central limit theorem for the Euler characteristic and Betti numbers. The functional strong law of large numbers for these topological invariants is also proven. This is joint work with Gennady Samorodnitsky (Cornell) and Gugan Thoppe (Duke).

5:25 - 5:55 Jean-Yves Welschinger (Université Lyon, France)
Title: TBA

Contributed Session: Random Matrices, Northwestern Room
Organized by Sean O'Rourke (UC Boulder, USA)

4:15 - 4:30 Indrajit Jana (Temple University, USA)
Title: CLT for non-Hermitian random band matrices with variance profiles

4:30 - 4:45 Hoi Nguyen (Ohio State University, USA)
Title: On random matrices over finite fields

4:50 - 5:05 Tom Trogdon (University of California, Irvine)
Title: The conjugate gradient algorithm on random matrices

Contributed Talks, Northwestern Room

5:05 - 5:20 Gursharn Kaur (National University of Singapore, Singapore)
Title: Interacting reinforcement on finite graphs

5:25 - 5:40 Hyun-Jung Kim (Illinois Institute of Technology, USA)
Title: Statistical Analysis of Evolution Equations Driven by Space-only Noise

5:40 - 5:55 Dan Goreac (Université Paris-Est, France)
Title: Order Avoidance for Controlled Systems; Impact on Gene Networks

5:55 – 6:10 Malkhaz Shashiashvili (Tbilisi State University, Georgia)
Title: Area Estimation between the Early Exercise Boundaries for the American Put Option with Different Local Volatilities

Contributed Session: Dynamics of SPDE, Lake Room
Organized by Jinqiao Duan (Illinois Institute of Technology, USA)

4:15 - 4:30 Jinqiao Duan (Illinois Institute of Technology, USA)
Title: Homogenization for Nonlocal Stochastic Partial Differential Equations

4:30 - 4:45 Jing Wang (Purdue University, USA)
Title: Graded large deviation principle for nilpotent hypoelliptic diffusion processes

Contributed Talks, Lake Room

4:50 - 5:05 Dimitar Atanasov (New Bulgarian University, Bulgaria)
Title: A robust approach for estimating the discrete time branching process with bivariate power series offspring distribution

5:05 - 5:20 Cristina Tone (University of Louisville, USA)

Title: A central limit theorem for non-stationary strongly mixing random fields

5:25 - 5:40 Hyoeun Lee (University of Illinois at Urbana-Champaign, USA)
Title: Optimal placement of a small order in a diffusive limit order book

5:40 - 5:55 Pavel Chigansky (The Hebrew University of Jerusalem, Israel)
Title: Accuracy in linear filtering with fractional noises

5:55 – 6:10 Nicholas Georgiou (Durham University, Georgia)
Title: Markov chains with heavy-tailed increments and asymptotically zero drift

Contributed Talks, Arch Room

4:15 - 4:30 Gleda Kutrolli (University of Tirana, Albania)
Title: Dynamic probabilistic forecasting with uncertainty

4:30 - 4:45 Vytaute Pilipauskaite (Aarhus University, Denmark)
Title: Aggregation of random-coefficient AR(1) processes with infinite variance

4:50 - 5:05 Chunxi Jiao (University of Sydney, Australia)
Title: Computable primal and dual bounds for stochastic control

5:05 - 5:20 Stephen Connor (University of York, UK)
Title: Cutoff for a One-sided Transposition Shuffle

5:25 - 5:40 Christian Döbler (University of Luxembourg, Luxembourg)
Title: Quantitative CLTs and FCLTs for U-statistics with applications

5:40 - 5:55 Robert Baumgarth (University of Luxembourg, Luxembourg)
Title: Scattering theory for the Hodge-Laplacian without assumption on the injectivity radius

5:55 - 6:10 Christophe Biscio (Aalborg University, Denmark)
Title: A general central limit theorem and subsampling variance estimator for α-mixing multivariate point processes

6:30 - 10:00 Dinner at Tapas Barcelona (ticket needed $40).

Friday, July 12th

8:30 - 9:30 Plenary Lecture, McCormick Auditorium

Yan-Xia Ren (Peking University, China)

Title: Spine decompositions and limit results for models with branching structure

Abstract: Consider a Galton-Watson process $((Z_n)_{n\geq 0};P)$ with offspring distribution $\mu = (\mu(n))_{n\geq 0}$. Let L be a random variable with law μ. Assume that $Z_0 = 1$ and the process is critical. Suppose L has finite variance. For simplicity, we will call a Galton-Watson process with offspring distribution μ a μ-Galton-Watson process. In this talk, I will describe a 1-spine decomposition and a 2-spine decomposition for the critical Galton-Watson tree and use the 2-spine decomposition to give a probabilistic proof of Yaglom's theorem: conditional on $(Z_n > 0)$, the law of Z_n/n converges to the exponential distribution.

Then I will establish a 1-spine decomposition theorem and a 2-spine decomposition theorem for some critical superprocesses. These two kinds of decompositions are unified as a decomposition theorem for size-biased Poisson random measures. These decompositions to can be used to give probabilistic proofs of the asymptotic behavior of the survival probability and Yaglom's exponential limit law for some critical superprocesses. The talk is based on a joint works with Renming Song and Zhenyao Sun.

9:30 - 10:30 Lévy Lecture, McCormick Auditorium

Massimiliano Gubinelli (University of Bonn, Germany)

Title: Stochastic analysis and quantum fields
Abstract: In recent years there have been substantial progresses in the understanding of certain classes of singular SPDEs which describes large scale non-linear fluctuations of particle systems. Some of these equations are also relevant to the construction of Euclidean quantum fields via the idea of stochastic quantisation. I will review this connection, the multiple ways stochastic
quantisation can be realised, and in general how stochastic analysis can be used to construct and analyse Euclidean quantum fields.

10:30 - 11:00 Coffee Break

11:00 - 12:00 Itô Lecture, McCormick Auditorium

Zhen-Qing Chen (University of Washington), McCormick Auditorium

Title: Brownian motion with darning and stochastic Komatsu-Loewner equations
Abstract: In this talk, I will discuss the properties of Brownian motion with darning, which can be constructed in domains of any dimension, and its connection to conformal maps in multiply connected planar domains. Its applications to the study of Momatu-Loewner equations and stochastic Komatu-Loewner equations will then be given. Based on joint work with Masatoshi Fukushima.