# East Midlands Stochastic Analysis Seminar

## Wednesday 12th June 2019

Organisers: Zdzislaw Brzezniak (York), David Elworthy (Warwick),
Chunrong Feng (Loughborough), Zhongmin Qian (Oxford) and Huaizhong Zhao (Loughborough)

## Programme

Wednesday 12th June Room MS.B3.02

1.30pm **Ying Hu** (Rennes) *Forward and Backward Stochastic Differential Equations with Normal Constraints in Law*

In this talk we investigate the well-posedness of backward or forward stochastic differential equations whose law is constrained to live in an a priori given (smooth enough) set and which is reflected along the corresponding "normal" vector. We also study the associated interacting particles system reflected in mean field and asymptotically described by such equations. The case of particles submitted to a common noise as well as the asymptotic system is studied in the forward case. Eventually, we connect the forward and backward stochastic differential equations with normal constraints in law with partial differential equations stated on the Wasserstein space and involving a Neumann condition in the forward case and an obstacle in the backward one.

2.30 pm **Francesco De Vecchi** (Bonn) *Elliptic Stochastic Quantization and Supersymmetry*

Stochastic quantization is based on a relation between invariant solutions to SPDEs and Gibbs measures. A similar relation between the solution to a particular family of non- linear elliptic SPDEs with additive noise in d + 2 dimensions and a corresponding Gibbs measure in d dimensions was conjectured, with the name of dimensional reduction, in the physics literature by Parisi and Sourlas [1]. We give a proof of this conjecture in the case d = 0, extending the work of Klein et al. [2] In the talk we propose an idea of the proof in some special cases following the original heuristic proof of Parisi and Sourlas and underling the role of supersymmetry. Indeed, even in our d = 0 context the arguments are non-trivial and a non-super symmetric proof seems only to be available in the Gaussian case. The talk is based on [3] which is a joint work with S. Albeverio and M. Gubinelli.

[1] Parisi G. and Sourlas N. (1979) Random Magnetic Fields, Supersymmetry, and Neg- ative Dimensions. Physical Review Letters, 43(11), 744–745.
[2] Klein A., Landau L. J. and Perez J. F. (1984) Supersymmetry and the Parisi-Sourlas dimensional reduction: a rigorous proof. Comm. Math. Phys., 94(4), 459–482.
[3] Albeverio S., De Vecchi F. C. and Gubinelli M. (2018). Elliptic stochastic quantization. arXiv preprint arXiv:1812.04422.

3.30pm Tea in Common Room

4pm (Probability seminar) **Maite Wilke Berenguer** (Bochum) *Simultaneous migration in the seed bank coalescent*

The geometric seed bank model describes the evolution of a population with active and dormant forms (`seeds') on a structure Markovian in both time directions , whose limiting objects posses the advantageous property of being moment duals of each other: The (biallelic) Fisher-Wright diffusion with seed bank component describing the frequency of a given type of alleles forward in time and a new coalescent structure named the seed bank coalescent describing the genealogy backwards in time. More recent results on extensions of this model will be discussed, focusing on the seed bank model with simultaneous migration: in addition to the spontaneous migration modeled before, where individuals decided to migrate independently of each other, correlated migration where several individuals become dormant (or awake) simultaneously is included. In particular, we will discuss the effect of the correlation on the property of coming down from infinity.
Joint work with J. Blath (TU Berlin), A. Gonzàlez Casanova (UNAM), & N. Kurt (TU Berlin).

5.15 pm Drinks in Common Room

If you are interested in joining us for lunch at 12:10pm, please contact David Elworthy.
In the evening we will be be going out for a pub meal, register soon with David Elworthy. (K.D.Elworthy@warwick.ac.uk)

All are welcome. There are possibilities of support for travel etc including for graduate students. For more details or accommodation arrangements contact David Elworthy or mrc@maths.warwick.ac.uk

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