Abstracts of the June 15, 2018 session of the Paris-London Analysis Seminar

Frédéric Bernicot (Université de Nantes),
A bilinear principle of orthogonality.

Abstract. The Rubio de Francia inequality allows us to describe the orthogonality in L^p (for $p > 2$) for Fourier projections associated to disjoint intervals (in frequency). We aim to describe a bilinear analogue of this principle, by considering bilinear Fourier projections and prove the bilinear counterpart of these inequalities. In the linear theory, the L^2 case is trivial as a direct consequence of Plancherel theorem. In the bilinear setting, there is no such easy first inequalities and any kind of inequalities is difficult to prove. It requires new arguments with respect to the linear case. This is joint work with Cristina Benea and Marco Vitturi.

Anne de Bouard (École polytechnique),
Stochastic effects in liquid crystal flows.

Abstract. We investigate existence and uniqueness of solutions for the liquid crystal flow driven by colored noise, on the two-dimensional torus (the so called Eriksen-Leslie equation). The PDE system couples a Navier Stokes equation for the fluid velocity of the liquid crystal and a gradient flow for the director, a vector field with values on the three dimensional sphere. The stochastic perturbations are white in time, and arise only on the director equation. The solutions we are looking for are in the spirit of the solutions found by Struwe for the deterministic harmonic map flow : they are piecewise regular, but may present singularities at discrete times and discrete points in space, in which the gradient of the director and the fluid velocity may concentrate in the L^2 space. This is a joint work with Antoine Hocquet and Andreas Prohl.

Ilya Goldsheid (Queen Mary University of London)),
Invariant measure equation for random walks on random environments on a strip.

Abstract. Environment viewed from the particle is a powerful method of analyzing random walks (RW) in random environment (RE). The well known fact is that in this setting the environment process is a Markov chain on the set of environments. In the talk I shall discuss the fundamental question of the existence of the density of the invariant measure of this Markov chain with respect to the measure on the set of environments for RWs on a strip. I shall describe all positive sub-exponentially growing solutions of the corresponding invariant density equation in a deterministic setting and then derive the necessary and sufficient conditions for the existence of the density when the environment is ergodic in both the transient and the recurrent regimes. Time permitting, I'll

also discuss the applications of our analysis to the question of positive and null recurrence and to random walks on orbits of a dynamical system. This is joint work with D. Dolgopyat

Alexander Sobolev (University College London),
Formulas of Szegő type for the periodic Schrödinger operator.

Abstract. We prove asymptotic formulas of Szegő type for the periodic Schrdinger operator $H = -\frac{d^2}{dx^2} + V$ in dimension one. Admitting fairly general functions h with $h(0) = 0$, we study the trace of the operator $h\big(\chi_{(-\alpha,\alpha)} E_{(-\infty,\mu)}(H) \chi_{(-\alpha,\alpha)}\big)$, as $\alpha \to \infty$, where $\chi_{(-\alpha,\alpha)}$ is the indicator of the interval $(-\alpha, \alpha)$ and $E_{(-\infty,\mu)}(H)$ is the spectral projection of H for the interval $(-\infty, \mu)$. This is joint work with Bernhard Pfirsch.