

# Öresund seminar

Thursday, November 15, 2018

Hörmander auditorium, Centre for Mathematical Sciences, Sölvegatan 18A, Lund

**Registration:** Please register at <https://goo.gl/forms/bENTwvIw8dfZIYF73> by Wednesday, November 7.

**13.15–14.05**

**Jan-Fredrik Olsen, Lund University**

BALIAN-LOW TYPE THEOREMS FOR FINITE SEQUENCES

This talk is based on a joint work with Shahaf Nitzan, where we formulate and prove finite dimensional analogues for the classical Balian-Low theorem as well as for a quantitative version previously obtained by Nitzan and Olsen. In particular, this answers the “Finite Balian-Low conjecture” posed in 2015 by Lammers and Stampe.

**14.15–15.05**

**Magnus Goffeng, Chalmers/University of Gothenburg**

THE MAGNITUDE OF GEOMETRY

Around a decade ago, Leinster introduced the notion of magnitude as a generalization of the Euler characteristic of a finite category. It has since been extended to an invariant of compact metric spaces. Taking these ideas one step further, one often considers the magnitude function: the magnitude of the space rescaled by a variable  $R > 0$ , which captures several of the space’s geometric features. I will recall this invariant and, focusing on the case of Riemannian manifolds with boundaries, describe the structure of the magnitude function. There are surprisingly few computations of magnitude that have been done. It was nevertheless conjectured by Leinster-Willerton that for convex domains, the magnitude function is a polynomial in  $R$  where the coefficients are the intrinsic volumes of the convex body (e.g. volume, surface volume, total mean curvature, ..., Euler characteristic). We prove an asymptotic version of this conjecture and show that the magnitude function extends meromorphically to the complex plane. For surfaces, we prove that the magnitude function recovers the Euler characteristic. Based on joint work with Heiko Gimperlein.

**Coffee break**

**15.45–16.35**

**Gerd Grubb, University of Copenhagen**

HEAT PROBLEMS FOR OPERATORS OF FRACTIONAL ORDER

When  $P$  is a strongly elliptic pseudodifferential operator of order  $2a > 0$  for noninteger  $a$ ,  $P$  is nonlocal, but one can define a realization of the homogeneous Dirichlet problem on an open subset  $\Omega$  of  $\mathbb{R}^n$  by a variational construction. This includes the example  $(-\Delta)^a$ , which has been much studied in recent years because of its interest in finance and probability as well as mathematical physics. When  $P$  moreover has even symbol, the regularity properties of solutions are well understood, always involving a power  $d^a$ , where  $d(x)$  is the distance to the boundary (assumed  $C^\infty$ ). In particular, a solution  $u$  with data in  $C^\infty$  has  $u/d^a$  in  $C^\infty$ .

After recalling these results, we shall discuss the associated heat equation  $Pu(x, t) + \partial_t u(x, t) = f(x, t)$ ,  $t > 0$ . Here regularity of solutions can be obtained in relatively low-order function spaces, but one meets the surprising fact that the smoothness in  $x$  at the boundary cannot in general be lifted beyond a certain point, even when  $f(x, t)$  is  $C^\infty$  up to the boundary. This is contrary to the properties of standard differential operator heat equations.

16.45–17.35

John Wheeler, University of Oxford

SUMS OF RANDOM MATRICES AND THE POTTS MODEL ON RANDOM PLANAR MAPS

I will start by briefly reviewing the random matrix method for understanding spin systems on quantum geometry represented by random planar maps. Then I will describe some improved techniques and new results for the case of the  $q$ -state Potts Model which enable the calculation of an extended set of correlation functions. These reveal some unexpected features.

### 19.00 Dinner at Restaurang Stadsparken

