Microlocal Day #4

"Noncommutative Harmonic Analysis and Probability"

Imperial College London, UK

5 March 2014 (Wednesday)

Organisers

Veronique Fischer
Michael Ruzhansky

(Imperial College London)

In the framework of LMS Joint Research Group"Noncommutative Harmonic Analysis and Probability"

Conference Venue: **Room 642 for 12am-2pm**, and **Clore Lecture Theatre for 2pm-6pm**, Huxley Building, Imperial College London

Address : Department of Mathematics, Imperial College London, 180 Queen's Gate, London SW7 2AZ, United Kingdom

The Microlocal Day is an occasional event devoted to intensive series of lectures or talks on different aspects of the microlocal analysis and related topics. The program includes research lectures as well as survey lectures aimed at researchers and PhD students interested in the subject. All are welcome to attend.

Previous events: Microlocal Day #1, Microlocal Day #2, Microlocal Day #3.

Speakers

- **Paula Cerejeiras** (University of Aveiro, *Portugal*)

- **Yasuo Chiba** (Tokyo University of Technology, *Japan*)
- **Clotilde Fermanian-Kammerer** (Université Paris Est, *France*)
- **Uwe Kähler** (University of Aveiro, *Portugal*)

Schedule

Wednesday, 5 March, 12am—5pm, Imperial College London

Room **642**

- **12:00-12:45 Uwe Kähler** (University of Aveiro, *Portugal*) *Discrete Dirac operators and non-commutative harmonic analysis*

Room **Clore Lecture Theatre**

- **14:00-14:45 Paula Cerejeiras** (University of Aveiro, *Portugal*) *Non-commutative harmonic analysis for difference-difference operators*
- **Coffee break**
- **15:00-15:45 Clotilde Fermanian-Kammerer** (Université Paris Est, *France*) *Long time analysis of solutions of completely integrable systems on the torus*
- **16:00-16:45 Yasuo Chiba** (Tokyo University of Technology, *Japan*) *Correspondence of some microlocal solutions for hyperbolic equations*

For further information please contact

Michael Ruzhansky at this e-mail address

SUGGESTION OF HOTELS IN THE AREA (EARL'S COURT STATION, 15 MINS WALK TO IMPERIAL COLLEGE)

Merlyn Court Hotel
Maranton House Hotel
Barkston Gardens
City Hotel Kensington
For other hotels see here

HOW TO GET TO THE DEPARTMENT OF MATHEMATICS, IMPERIAL COLLEGE LONDON

Travel to the tube station **Gloucester Road** (District, Circle, and Piccadilly Lines).
When you exit the station, turn left along Gloucester Road, crossing Cromwell Road 50 meters from the exit.
After 4-5 minutes walk along Gloucester Road, turn right to Queen's Gate Terrace.
This is a short road leading directly to the entrance of the Huxley Building, at 180 Queen's Gate. We are on floor 6.

Abstracts

Paula Cerejeiras (University of Aveiro, *Portugal*) *Non-commutative harmonic analysis for difference-difference operators*

In many applications it would be advantageous to have a function theory based on reflection groups instead of on rotation groups, for example, in the analysis of quantum many-body systems of Calogero–Moser–Sutherland type or the study of crystallographic structures. This is the starting point for differential-difference operators, or Dunkl operators. In this rather recent theory differential operators are replaced by a commuting algebra of differential-difference operators which are invariant under the action of some finite reflection group. Their importance is based on the fact that they allow an analysis of the waves of certain quantum harmonic oscillators linked to specific physical models. Some promising results for solving differential-difference equations were obtained by an explicit construction of spherical Dunkl wavelets. In this talk we present a construction of Dunkl-monogenic and Dunkl-harmonic functions starting from holomorphic functions in the plane, based on Vekua-type systems. Additionally, we prove a version of Fueter's theorem in the case of finite reflection groups and present some examples as well as giving a construction method of Dunkl-wavelets.

Yasuo Chiba (Tokyo University of Technology, *Japan*) *Correspondence of some microlocal solutions for hyperbolic equations*

In this talk, I show the properties of microlocal solutions of boundary value problems for degenerate hyperbolic operators. Here, 'microlocal' means hyperfunction (or microfunction) solutions. We use a transformation of coordinates with fractional power to construct them. We shall present the properties of solutions through this transformation as well as correspondences to the WKB solutions.

Clotilde Fermanian-Kammerer (Université Paris Est, *France*) *Long time analysis of solutions of completely integrable systems on the torus*

In this talk, I will present a work in collaboration with Nalini Anantharaman and Fabricio Macia devoted to the study of the behaviour in large time of solutions of semiclassical pde's of Schrödinger type on the torus. We will be interested in the weak limits of densities associated with the solutions, averaged on large intervals of time. We will shed light on the existence of a threshold above which every weak limit of the densities is absolutely continuous with respect to Lebesgue measure. This result holds for a large class of completely integrable equations.

Uwe Kähler (University of Aveiro, *Portugal*) *Discrete Dirac operators and non-commutative harmonic analysis*

In the last decades one can observe an increased interest in discrete structures, in particular in discrete Dirac operators. This lead also to the question of the corresponding discrete function theory, i.e. the theory of null-solutions of the discrete Dirac operators. But here a problem arises. While in the continuous case methods of non-commutative harmonic analysis where successfully employed, such methods run into the problem that in the discrete case there exist two partial difference operators instead of a single partial derivative. Although these difference operators commute the same cannot be said about the corresponding vector variable operators, i.e. the operators which form the Heisenberg algebra. This means that we cannot use the usual algebraic duality between polynomials of derivatives and polynomials of multiplication operators. In this talk we will present a possible way out by replacing the Heisenberg algebra with a Heisenberg-Sommen algebra and establish the principal tools for a discrete function theory.

Previously organised: Microlocal Day #1, #2, #3