

# FIELDS-CARLETON



## DISTINGUISHED LECTURE SERIES



**Uffe Haagerup**

*University of Copenhagen*

**Approximation properties for  
groups and  $C^*$ -algebras**

Friday, April 4, 2014 at 3:30 pm

4351 HP (MACPHAIL ROOM)

CARLETON UNIVERSITY

### ABSTRACT

It is a classical result in Fourier analysis that the Fourier series of a continuous function may fail to converge uniformly or even pointwise to the given function. However, if one uses a summation method as, e.g., Cesaro mean convergence, one actually gets uniform convergence of the Fourier series. This result can easily be generalized first to all abelian LC (= locally compact) groups, and next to all amenable (LC) groups, where in the non-abelian case, the continuous functions on the dual group should be replaced by the reduced group  $C^*$ -algebra of the group.

In 1994 Jon Kraus and I introduced a new approximation property (AP) for locally compact groups. The groups having (AP) form the largest class of LC groups for which a generalized Cesaro mean convergence theorem can hold. The group  $SL(2, \mathbb{R})$  has this property, but it was only proven recently by Vincent Lafforgue and Mikael de la Salle that  $SL(n, \mathbb{R})$  fails to have (AP) for  $n = 3, 4, \dots$ . In joint work with Tim de Laat we extend their result by proving that  $Sp(2, \mathbb{R})$  and, more generally, all simple connected Lie groups of real rank at least 2 and with finite centre do not have the (AP).

In the talk I will give an introduction to amenability, weak amenability and the property (AP) for locally compact groups, and the corresponding properties for  $C^*$ -algebras will also be discussed. Weak amenability is another approximation property for LC groups.

### BIOGRAPHICAL INFORMATION

Professor Haagerup is among the world's leading mathematicians, having made ground-breaking contributions in a variety of areas ranging from operator algebras and operator theory to free probability, random matrices and applications in mathematical physics. Modern functional and harmonic analysis even reflects his tremendous influence through fundamental concepts bearing his name that have entered the mathematical lexicon, such as the Haagerup tensor product and the Haagerup property. His many honours include an invited lecture at the ICM 1986 (Berkeley) as well as plenary lectures at both the ICM 2002 (Beijing) and the ICMP 2012 (Aalborg). He received the 14th European Latsis Prize from the European Science Foundation in 2012, and presently holds an Advanced Grant from the European Research Council. He is a member of the Royal Danish Academy of Sciences and Letters, as well as the Norwegian Academy of Science and Letters.

