ANALYSIS SEMINAR

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Injectivity of the modules $L^p(G)$

by

H. G. Dales

University of Lancaster, UK

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ABSTRACT

Let A be a Banach algebra, and let E be a Banach A-bimodule. A basic question is to determine when E is injective (in a sense that I shall explain). A fundamental result of Helemski is that E is injective whenever A is an amenable Banach algebra and E is a dual module. The following has been open for a long time:
Suppose that all (or some specific) dual Banach A- bimodules are injective. Does it always follow that A is amenable?
Let G be a locally compact group, and let $L^1(G)$ be the standard group algebra. Then $L^p(G)$ is a Banach $L^1(G)$-bimodule for each $p \geq 1$, and it is a dual module when $p > 1$. Suppose that G is an amenable group. Then $L^1(G)$ is an amenable Banach algebra, and so $L^p(G)$ is injective for each $p > 1$. We can now show that, conversely, G is amenable whenever $L^p(G)$ is injective for some $p > 1$. Our approach is to use the theory of 'multi-norms', which I shall go over briefly. The talk is based on the following paper:
H. G. Dales, M. Daws, H. L. Pham, and P. Ramsden, Multi-norms and the injectivity of $L_p(G)$, J. London Math. Soc., to appear.

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Davidson Lecture Hall, Claremont McKenna College
For more information contact Asuman G. Aksoy at aaksoy@cmc.edu