

The Coxeter-James Lectureship was inaugurated in 1978 to recognize young mathematicians who have made outstanding contributions to mathematical research and is presented in conjunction with the Canadian Mathematical Society's Winter Meeting.

Le prix de conférence Coxeter-James, créé en 1978, rend hommage aux jeunes mathématicien(ne)s qui se sont distingué(e)s par leur apport exceptionnel à la recherche en mathématiques. Elle est présentée dans le cadre de la réunion d'hiver de la Société mathématique du Canada.

*RECIPIENTS / RÉCIPIENDAIRES*

|      |                 |
|------|-----------------|
| 1978 | R. Moody        |
| 1979 | D. Boyd         |
| 1980 | F. Clarke       |
| 1981 | J. Millson      |
| 1982 | J. Mallet-Paret |
| 1983 | M.D. Choi       |
| 1984 | M. Goresky      |
| 1985 | P. Selick       |
| 1986 | E. Perkins      |
| 1987 | J. Borwein      |
| 1988 | R. Murty        |
| 1989 | A. Dow          |
| 1990 | N. Ghoussoub    |
| 1991 | K. Murty        |
| 1992 | J.F. Jardine    |
| 1993 | J. Hurtubise    |
| 1994 | M. Spivakovsky  |
| 1995 | G. Slade        |
| 1996 | N. Higson       |

*The 19th Coxeter-James Lecture  
La 19ième Conférence Coxeter-James*



*Nigel Higson  
Pennsylvania State  
University*

*CMS Winter 1996 Meeting  
Réunion d'hiver 1996 de la SMC  
London, Ontario  
December 9, 1996 / 9 décembre 1996*

## *BIOGRAPHICAL INFORMATION*

Nigel Higson is a professor of mathematics at the Pennsylvania State University. He received his doctoral degree in 1986 from Dalhousie University in Halifax, Nova Scotia, where he worked under the direction of Peter Fillmore. After graduating from Dalhousie, he was an assistant professor at the University of Pennsylvania for three years, before moving to the Pennsylvania State University in 1989.

Professor Higson's research interests center around operator algebras and K-theory. His early work concerned the KK-theory of Gennadi Kasparov - the principal technical tool linking operator algebras to applications in geometry and topology. In joint work with Alain Connes, he developed the theory of "asymptotic morphisms," an important simplification of Kasparov's theory. Since then, his research has been concentrated on the Baum-Connes conjecture, a broad program which connects operator algebras and K-theory to problems in differential topology, Riemannian geometry, and various areas of representation theory. Along with Baum and Connes, he is responsible for the current form of the conjecture, and in recent joint work with Kasparov he has proved a number of cases of the conjecture, unifying several previous advances.

Professor Higson was awarded an Alfred P. Sloan Foundation fellowship in

1992. He was a plenary speaker at the summer meeting of the Canadian Mathematical Society in 1994, and was awarded the André Aisenstadt prize of the Centre de recherches mathématiques and the Israel Halperin Prize of the *Canadian Operator Symposium*, both in 1995. He is married to Yvonne Gaudelius, who is also on the faculty of the Pennsylvania State University, and the two of them are the proud parents of a baby daughter, Julia, who was born last May.

## *ABSTRACT*

### *Kasparov's Representation Rings for Noncompact Groups*

If  $G$  is a compact group then its representation ring  $R(G)$  is the free abelian group on the set of equivalence classes of complex linear representations of  $G$  (the tensor product operation on representations makes  $R(G)$  into a commutative ring). Motivated by problems in topology, Kasparov introduced a very interesting extension of the definition of  $R(G)$  to the case where  $G$  is noncompact. I will try to explain Kasparov's definition; its relation to topology, geometry and representation theory; and some of the many open questions concerning  $R(G)$ .

## *CITATION / PRÉSENTATION*

Nigel Higson has done deep work on the relationship between the algebraic and analytic structure of  $C^*$ -algebras, especially in the area of  $K$ -theory. In his 1986 thesis, he studied the algebraic  $K$ -theory of  $C^*$ -algebras. Much of his work has dealt with Kasparov's bivariant  $K$ -theory, the  $KK$  functor. While this has been a basic tool for studying  $C^*$ -algebras, it has a serious failing in that it fails to satisfy excision in the first variable. Higson and Connes have developed a new bivariant  $K$ -theory, called  $E$ -theory, which overcomes this failing and simultaneously simplifies many technical aspects. Other recent work deals with elliptic operators and index theorems generalizing the famous Atiyah-Singer theory.

$K$ -theory has become a tool of central importance in the study of  $C^*$ -algebras and related problems dealing with group representations and with geometry. Higson's work has played an important role in this development. As an outstanding young operator algebraist and a Canadian emissary abroad, Higson is a very deserving winner of this year's Coxeter-James prize.

Nigel Higson a fait des recherches poussées sur les liens entre les structures algébrique et analytique des  $C^*$ -algèbres, particulièrement dans le domaine de la  $K$ -théorie. Dans sa thèse, en 1986, il a étudié la  $K$ -théorie algébrique des  $C^*$ -algèbres. Une grande partie de son travail concerne la théorie bivariante de Kasparov ou  $KK$ -théorie, qui est un outil précieux dans l'étude des  $C^*$ -algèbres. Cependant la  $KK$ -théorie ne satisfait pas la propriété d'excision en la première variable. Higson et Connes ont inventé une nouvelle  $K$ -théorie bivariante, appelée  $E$ -théorie, qui possède cette propriété d'excision et qui simplifie aussi de nombreux aspects techniques. Ses récents travaux portent également sur les opérateurs elliptiques et les théorèmes de l'indice, qui généralisent la célèbre théorie d'Atiyah-Singer.

La  $K$ -théorie est devenue un des outils principaux de l'étude des  $C^*$ -algèbres et des problèmes reliant géométrie et représentations des groupes. Nigel Higson mérite pleinement le prix Coxeter-James de cette année, car il est un excellent jeune spécialiste de la théorie des algèbres d'opérateurs et un émissaire canadien à l'étranger.