

The Jeffery-Williams Lectureship was inaugurated in 1968 to recognize mathematicians who have made outstanding contributions to mathematical research and is presented in conjunction with the Canadian Mathematical Society's Summer Meeting.

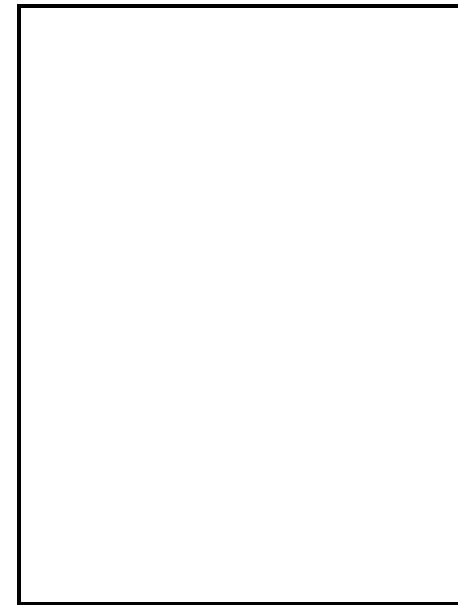
La conférence Jeffery-Williams, créée en 1968, rend hommage aux mathématiciens qui se sont distingués par leur apport exceptionnel à la recherche en mathématiques. Elle est présentée dans le cadre de la réunion d'été de la Société mathématique du Canada.

RECIPIENTS / RÉCIPIENDAIRES

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I. Kaplansky
R. Pyke
W.A.J. Luxemburg
W.T. Tutte
P.J. Davis
H.S.M. Coxeter
H.J. Zassenhaus
N.S. Mendelsohn
M. Wyman
G. Duff
G. Gratzer
I. Halperin
R.P. Langlands
J.E. Marsden
J. Lipman
R.H. Bott
C.S. Morawetz
L. Siebenmann
C. Herz
L. Nirenberg
J. Lambek
E.C. Milner
R. Steinberg
P. Lancaster
I. Sigal
J.G. Arthur
Donald Dawson
Robert V. Moody
Mark Goresky
Steve Halperin

The 30th Jeffery-Williams Prize Lecture *Le 30ème Prix de conférence Jeffery-Williams*



Steve Halperin
University of Toronto



1997 CMS Summer Meeting
Réunion d'été 1997 de la SMC
Winnipeg, Manitoba
June / juin 1997



BIOGRAPHICAL INFORMATION

Steve Halperin was born February 1, 1942 in Kingston, Ontario, where his father, Israel, was a recently appointed member of the Queen's University Mathematics Department. He received an Honours B.Sc. in Mathematics from the University of Toronto in 1965 and a Ph.D. from Cornell University in 1970. In 1970, he joined the Department of Mathematics, University of Toronto. He was promoted Associate Professor in 1974 and Professor in 1979, and appointed Chair of the Department for the period 1991-95 and 1996-99. Since 1994 he has been Chair of the University's Task Force on Mathematical Science.

Steve's research is in the field of rational homotopy theory within algebraic topology. He has published 65 papers, many in leading journals, and co-authored three monographs. His former graduate students and postdoctoral fellows hold faculty positions in Canada, France, Spain and Switzerland and he maintains an active joint research collaboration with colleagues in Belgium and France. He has held visiting positions in Belgium, France, Germany, Spain and Sweden.

In addition to his work as a teacher and researcher Steve has been active within the Canadian mathematical community, serving on the old CMS Council and the more recent CMS Board of Directors, as well as organizing workshops, conferences and a special CMS session. He was a member of the original organization committee to create The Fields Institute and has served on the Institute's Board of Directors. More recently he has been an active member of the Mathematics-NSERC Liaison Committee. He presently serves on the NSERC Re-allocation Committee and as the university mathematician on Ontario's Expert Panel to revise the high school mathematics curriculum.

Lusternik-Schnirelmann category, homotopy groups and graded Lie algebras

Steve Halperin

If a topological space X can be written as the union of $m+1$ open sets, each contractible in X , then X has LS category m . This defines an important homotopy invariant which is extraordinarily difficult to compute. It was introduced in the 30's and shown to be a lower bound for the number of critical points of a smooth function. More recently it has turned out that LS category plays a significant role in the properties of the homotopy groups of X and their Lie structure. This talk will be a general survey of old and new results in the area.

CITATION

In a paper published in the Annals of Math in 1972, Halperin, in collaboration with Toledo Domingo, gave a very nice and useful combinatorial formula for the Stiefel-Whitney classes of a smooth manifold. His next major contribution was the writing of three well known and major volumes with Werner Greub and Ray Vanstone - Connections, curvature and cohomology. These books give a very deep algebraic insight into the cohomology theory of homogeneous spaces in the spirit of Cartan. Their approach was very algebraic. In fact it was so algebraic that one can say these books prove that differential geometry, more precisely the part of geometry that studies differential forms, connections, curvature and characteristic classes, is in fact mainly differential homological algebra. These books have had an important influence on the study of geometry of connections, curvature and cohomology classes. They are the one and only reference for this part of the geometry of manifolds. The third book was published in 1976, and at that time there were 2 mathematical theories: characteristic classes (exotic classes) and rational homotopy with Dennis Sullivan. After some work on exotic classes, Halperin made an important contribution to the development of rational homotopy in his book *Lectures on Minimal Models*.

Since 1980, Steve Halperin has been the leader of an international research group working in rational homotopy, and more precisely in applications of the techniques of rational homotopy to geometry and algebraic topology. Using rational homotopy, he and his co-authors have produced many striking results in local algebra, algebraic topology or differential geometry.

Dans un article publié en 1972 dans les *Annals of Mathematics* en collaboration avec Toledo Domingo, Halperin a donné une belle et utile formule combinatoire pour les classes Stiefel-Whitney d'une variété lisse. Par la suite, une contribution majeure a été la préparation de trois volumes significatifs et bien connus avec la collaboration de Werner Greub et Ray Vanstone - Connections, curvature and cohomology. Ces livres présentent un aperçu algébrique pénétrant de la théorie cohomologique des espaces homogènes d'après Cartan. Leur approche a été plutôt algébrique. En fait, elle a tellement été algébrique que l'on pourrait même en déduire de ces livres que le géométrie différentielle, plus précisément le domaine de la géométrie qui étudie les formes différentielles, courbures et classes caractéristiques, soit en réalité surtout formée de l'algèbre différentielle homologique. Ces livres ont porté une influence importante sur l'étude de la géométrie des connections, courbures et classes cohomologiques. Ils forment l'une et seule référence pour cette branche de la géométrie des variétés. Le troisième livre a été publié en 1976, et on trouvait à cette époque deux théories mathématiques : les classes caractéristiques (classes exotiques) et l'homotopie rationnelle avec Dennis Sullivan. À la suite d'ouvrages sur les classes exotiques, Halperin a fait une contribution importante au développement de l'homotopie rationnelle dans le livre *Lectures on Minimal Models*.

Depuis 1980, Steve Halperin a pris la tête d'un groupe international de recherche se penchant sur l'homotopie rationnelle, plus précisément sur les applications des techniques de l'homotopie rationnelle à la géométrie et la topologie algébrique. Utilisant l'homotopie rationnelle, ils ont produit conjointement plusieurs résultats remarquables en algèbre locale, topologie algébrique et géométrie différentielle.