



Professor, 1975

A.B. 1961, Princeton University, summa cum laude

Ph.D. 1965, Trinity College, Cambridge University, U.K.

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Activities and Awards

Mathematical Interests

My interests since 1978 have included the study of finitely presented groups and their geometric properties. Perhaps the most interesting and important question in the field is the word problem, which asks whether it is possible to devise an algorithm to decide whether or not words in the generators of a finite presentation represent the identity element of the group presented. It has been known since the work of Novikov and Boone in the late 50's that the word problem is not solvable in general. This makes it of even greater interest to identify those presentations whose word problem is solvable and discuss their nature from various perspectives. It is remarkable that this problem has deep geometric, analytic, and algorithmic connections.

In a lecture at MSRI in January 1990 I defined the Dehn function associated with a finite presentation and showed that the solvability of the word problem was equivalent to this function being computable (*recursive*). In the same lecture, I gave geometric and algebraic-topological methods for estimating the Dehn function. That lecture is the content of item (6) above, and the study of the Dehn function has occupied my attention for the past decade. One of the more notable results is a vanishing theorem which gives an algebraic-topological criterion for a group to be hyperbolic, an important and ubiquitous class of groups

first identified by M. Gromov, which in the present context can be taken to mean that the Dehn function has linearly bounded growth (item (1) above).

At the request of the former Dean of Sciences and the University Vice-President for Academic Affairs, I scaled down my activities in the department, and I am now semi-retired. I keep active mathematically by collaboration with people from other universities and with post-docs

Selected Publications

1. (with Daniel Allcock) A homological characterization of hyperbolic groups, *Inv. Math.* **135** (1999) (3) 723-742
2. Cohomological lower bounds for isoperimetric functions on groups, *Topology* **37** (1998) pp. 1031-1072.
3. Subgroups of word hyperbolic groups in dimension 2, *Jour. London Math. Soc.* **54** (1996) 261--283.
4. Automatic groups and amalgams (joint with G. Baumslag, M. Shapiro, and H. Short), *Jour. Pure Appl. Algebra* **76** (1991) 229--316.
5. Rational subgroups of biautomatic groups (joint with H. Short), *Annals of Math.* **134** (1991) 125--158.
6. Dehn functions and l_1 -norms of finite presentations, Algorithms and Classification in *Combinatorial Group Theory* (eds. G. Baumslag and C. F. Miller III) MSRI series 23, Springer-Verlag (1991) 195--224.
7. Fixed points of automorphisms of free groups, *Adv. in Math.* **64** (1987) 51--85.