

## Professor Graham Higman: Leading group theorist

Thursday, 8 May 2008

Graham Higman was one of the most significant British group theorists of the 20th century, alongside William Burnside and Philip Hall, succeeding his former Balliol tutor and research supervisor, Henry Whitehead, as Waynflete Professor of Pure Mathematics at Oxford University in 1960.

Higman strongly held the view that pure mathematics should be studied for its beauty rather than its utility, and he once remarked that finite group theorists were the natural successors to the classical geometers, though his own work spanned both finite and infinite groups. His thesis on integral group rings, published in 1940, had arisen from a geometric question in algebraic topology; his mathematical career was then interrupted while, after registering as a conscientious objector, he served in the Met Office in Northern Ireland and Gibraltar.

When Max Newman was building the Mathematics Department at Manchester along lines then rare in British universities, but modelled on his experience at Bletchley Park, Higman was appointed a lecturer as part of an intensely research-oriented group of young mathematicians.

Geometrically, group theory can be viewed as an abstract study of symmetry; abstractly, a group consists of a collection of elements that may be combined by "multiplication" subject to certain laws. In layman's terms, Higman asked how, and indeed whether, given what purport to be parts of a group, the pieces actually fit together inside a larger group. His most important early work at Manchester was on infinite groups, first in joint work with Bernhard and Hanna Neumann on HNN-extensions, and later for his theorem that any finitely generated group can be embedded in a finitely presented group if, and only if, it is recursively presented. The latter was of especially wide interest since he needed to work at the boundaries of logic to establish the concept of relations being "recursively enumerable".

It was in his Manchester years, too, that Higman worked on the Burnside problems, leading ultimately to his celebrated joint paper with Philip Hall in 1956 ("On the  $p$ -length of  $p$ -soluble groups and reduction theorems for Burnside's problem", published in the Proceedings of the London Mathematical Society). This paper has proved the foundation for ideas that have influenced finite group theorists ever since.

He returned to Oxford in 1955, and was elected to the Waynflete Chair following Whitehead's premature death. Higman spent the year 1960-61 in Chicago at a time when there was an explosion of interest in finite simple groups, following Thompson's thesis which had seen an almost unimaginable extension of the Hall-Higman methods; it was during that year that the Odd Order Theorem was proved.

Higman realised that this represented the future of the subject, but he never fully embraced it. Ever the maverick, he embarked a few years later on a programme of odd characterisations of simple groups that fuelled many a thesis, but neither these nor his own work formed part of the core attack on their classification. However, his particular expertise in piecing together groups, rather like solving a giant jigsaw, led to his construction of two of the sporadic groups, the third Janko group and Held's group, both with the computational assistance of John McKay.

As Waynflete Professor he had numerous students; to each he gave individual attention, not with scheduled meetings, but with the instruction that they should appear for tea, attend colloquia and his advanced class, and come to see him when they had something to say or ask. He might be sitting calculating at his glass blackboard, but he would put that aside to help the student, and many of his own ideas, sketched on that board, would find publicity only under the student's name; Higman did not suggest joint authorship and he surely could not have tolerated the Research Assessment Exercise.

Some found him intimidating, not least by his choice of words. He once remarked that there were three types of student: those who wrote their own theses; those for whom he wrote their thesis and they understood it; and those for whom he wrote their thesis but they did not. To one former student he said, "When I asked you a question, I didn't expect you to prove a theorem", but he was generous with his time and help to all. Friends were not exempted from his comments; one, after giving a lecture entitled "A logical approach to HNN-extensions", was firmly told, "And for a logical and intelligible account, read the original paper."

A mathematically modest man who mellowed in his later years, he knew when he had proved a good result. One of those who commissioned Higman's portrait by Norman Blamey RA exclaimed when first shown the

painting, "That's the Graham we all know and love – I've proved a good theorem, you lot do better!" Many a seminar speaker was faced by this portrait, hung at the Oxford Mathematical Institute in the Higman Room that was established to mark his retirement in 1984.

Higman was the second son of a Methodist minister. He won a natural sciences scholarship from Sutton's Secondary School, Plymouth, to Balliol and it is said that one reason he took up mathematics was because his older brother had read chemistry. He took his upbringing seriously and became a local preacher in 1936, officiating regularly until 2001. When his wife died in 1981, Higman himself gave the funeral address.

That address, like most of his lectures, was given without notes. There was an even flow of prose and mathematics in his lectures, with the use of the adjoining board for details, and his advanced classes often contained his most recent thinking – occasionally he arrived late if some detail had not quite worked out in the way hoped.

As a professor he always dressed in jacket and tie but, especially in his later years, he could be sartorially challenged. Blamey complained that he once had to tell Higman to return for the next sitting with a button resewn on his jacket, while he had "ironed Professor Higman's shirt" when painting. After retirement, Higman was more likely to be seen in a green ornithological T-shirt, even in the pulpit.

His appearance was distinctive. The beard, he claimed, resulted from a broken razor during a family summer holiday in 1966 while, when Don Higman, a US group theorist visiting Oxford, arrived with similar eyebrows, it emerged that his family had emigrated from a Cornish village not far from one in which Higman's family had once lived. Any relationship has never been verified.

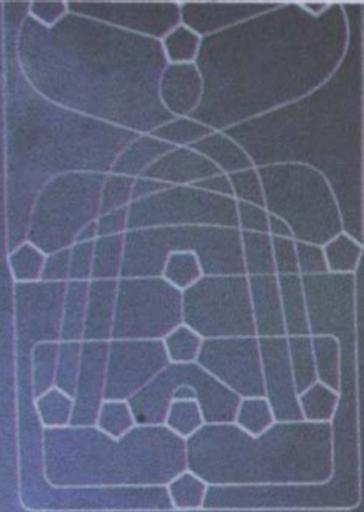
Relaxation came from bird-watching, and Higman would often arrive in the morning at the Mathematical Institute in a shabby raincoat, binoculars around his neck, to report on the latest sighting. He remained active in the Wesley Memorial Church in Oxford with a particular love for Wesley's hymns, and he participated in one of its book reading groups until about three years ago. For many years, too, he was involved with the Samaritans.

His physical health deteriorated substantially in his later years but his mind did not. When a conference was held at the time of his 90th birthday last year and to mark the 50 years since the Hall-Higman paper, very much to everyone's surprise and pleasure he asked to be brought, tidier than anyone could remember him, and he closely followed the two lectures that he chose to attend. He was not seen in public again.

Michael Collins

**Graham Higman, mathematician: born Louth, Lincolnshire 19 January 1917; Lecturer in Mathematics, Manchester University 1946-55; Reader in Mathematics, Oxford University 1955-60, Waynflete Professor of Pure Mathematics 1960-84 (Emeritus); FRS 1958; Fellow, Magdalen College, Oxford 1960-84; President, London Mathematical Society 1965-67; Editor, Journal of Algebra 1964-84; married 1941 Ivah Treleaven (five sons, one daughter); died Oxford 8 April 2008.**

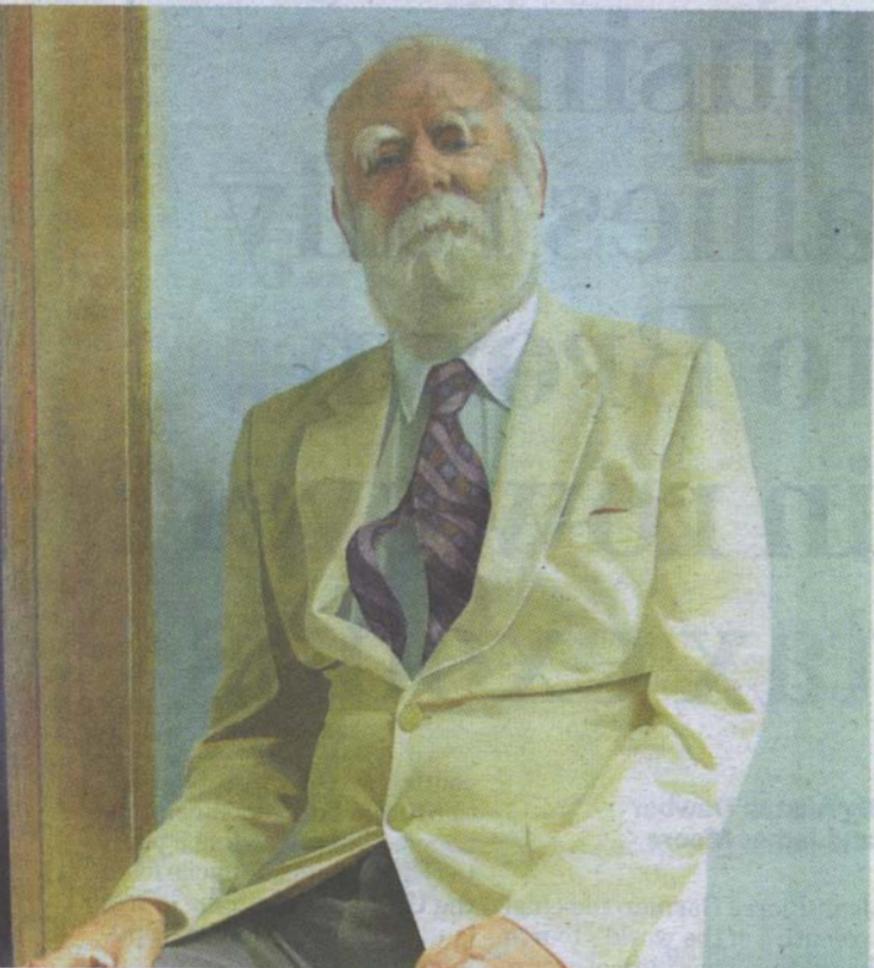
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genius 2



'Professor Graham Higman', 1984 portrait by Norman Blamey RA, who 'ironed Professor Higman's shirt' when painting