John Hammersley

By **Dominic Welsh**

Dr John Hammersley, Mathematical Statistician; Pioneer in the Study of Percolation and Random Growth Processes, died on 2nd May 2004 aged 84. He was a remarkable and fearless problem-solver and an exceptionally inventive mathematician. One of his great strengths was an ability to pinpoint the basic mathematics underlying a scientific problem and to develop a useful theory. A notable example was his seminal paper with S.R. Broadbent on 'Percolation Processes', written in 1957 and motivated by a problem on the spread of gas molecules though a porous solid. Unlike previous studies of particles moving randomly in space, in this problem the randomness existed solely in the porous medium. Largely through his influence percolation is now a huge area of ongoing research in both mathematical probability and statistical physics with many applications in the physical and natural sciences, a typical example being the spread of blight though an orchard. Closely related was the easily stated, but horrendously difficult, 'self-avoiding walk' problem. This concerned the behavior of a non-intersecting random walk in a crystal lattice. It, too, has many applications, particularly in the polymer industry, but complete answers of the type Hammersley sought in the early sixties are still not known, and several of his pioneering results are now classical.

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From his earliest days Hammersley had great respect for 'bare hands' numerical work in order to give some insight into how the random processes he was studying actually behaved. This could involve enormous calculations or simulations on what are today seen as primitive machines. In the early sixties the Oxford mainframe, although physically huge, had far less storage than a modern calculator. Large simulations needed to be written in machine code and a typical run could take 24 hours. These experiences in large-scale computing on relatively tiny machines provided the case studies for his ground-breaking work 'Monte Carlo Methods' (1964) written with his ex-student D.C. Handscomb. Now in its 5th edition it has been a major influence in the spread of these techniques.

John Hammersley went to school at Sedbergh and from there, with a scholarship, to Emmanuel College, Cambridge in October 1939. His undergraduate career was interrupted by military service from 1940 – 45. While in the army he developed a range of technical expertise in areas such as radar and gunnery, to the extent that he ended up being responsible for the radar installations of the gun-sites defending Scapa Flow. When he was in charge of the computations analysing the performance of anti-aircraft equipment he introduced a reform of which he was proud, replacing the 7-figure tables of trigonometric functions by 4-figure ones which were ample for the necessary approximations. By the end of the war he was a Major in the Royal Regiment of Artillery, and in 1946 resumed his undergraduate career graduating with a first class in Part 2 of the Tripos.

In 1948 Hammersley came to Oxford and after a short spell at AERE Harwell became a Senior

Research Officer in the Institute of Economics and Statistics. In 1969 he was appointed Reader in Mathematical Statistics and elected a Professorial Fellow at Trinity and he remained in this position until his retirement in 1987. He continued his research after retirement as Emeritus Fellow at Trinity attached to the Oxford Centre for Industrial and Applied Mathematics. Major achievements in this period were his papers with G. Mazzarino on the dendritic growth of crystals and the growth of Eden clusters. The Eden growth model had been of great interest to Hammersley since 1961, and it was fitting that his research career should draw to a close with an analytic and computational study of the roughness of a cluster surface.

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In his distinguished career. as well as holding Doctorates of Science from both Oxford and Cambridge, he was awarded the Von Neumann Medal for Applied Mathematics by the University of Brussels (1966), elected a Fellow of the Royal Society (1976), was the Rouse Ball Lecturer of the University of Cambridge in 1980, awarded the Gold Medal of the Institute of Mathematics and its Applications (1984) and the Pólya Prize of the London Mathematical Society in 1997.

Hammersley was a gentleman of the old school, with very high standards. Curiosity and originality pervaded his whole life; he was always stimulating and wonderfully entertaining company. Away from his mathematics he was a cultured man, fond of poetry and devoted to his family. He was happily married to Gwen for 53 years, and she and his two sons, Julian and Hugo, survive him.

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Postscript

by **Hilary Ockendon**

Does anyone else remember the lectures on "Solving Problems" given for undergraduates by John Hammersley in the 1960's? I was not a very avid lecture goer but in Michaelmas Term 1960 I went to every one of these weekly lectures even though they were nothing to do with the syllabus. Hammersley started by listing a motley collection of problems; some were fairly simple brain teasers, others more complicated but they were all what he called "hard" problems that required **thought** on the part of the solver. Over the term Hammersley gave answers to all the problems he posed – some were one-liners (geometric problems solved "by symmetry"), more took a page or two of reasoning and some required a considerable amount of mathematical apparatus to be set up. At the most difficult end was a problem on self avoiding walks which I think was his current research topic. He also introduced us to the theory of quaternions and used it to show that all integers can be written as the sum of four squares. Mixed in with these problems were geometric constructions, penny weighing problems, how to divide a loaf fairly between n people etc. He delivered these lectures in his usual low key, business like way, and although I never had to learn the material for an exam these are the lectures I remember best 40 years on.

Finally, here is one of his problems (an easy one):

Given two points A and B, find the midpoint of AB using **only** a pair of compasses (no ruler). There are no prizes for the solution but maybe it will stretch a few mathematical muscles!