John Ashworth Nelder: 8 October 1924 – 7 August 2010.

John Nelder died on Saturday 7th August 2010 in Luton & Dunstable Hospital UK, where he was recovering from a fall. John was very active even at the age of 85, and retained the strong interest in our work – and statistics generally – that we will all remember with deep affection. However, he was becoming increasingly frail and it was a shock but perhaps, in retrospect, not a surprise to hear that he had died peacefully in his sleep.

John was born on 8th October 1924 in Dulverton, Somerset, UK. He was educated at Blundell's School and at Sidney Sussex College, Cambridge where he read Mathematics (interrupted by war service in the RAF) from 1942-8, and then took the Diploma in Mathematical Statistics.

Most of John's formal career was spent as a statistician in the UK Agricultural Research Service. His first job, from October 1949, was at the newly set-up Vegetable Research Station, Wellesbourne UK (NVRS). Then, in 1968, he became Head of the Statistics Department at Rothamsted, and continued there until his first retirement in 1984. The role of statistician there was very conducive for John, not only because of his strong interests in biology (and especially ornithology), but also because it allowed him to display his outstanding skill of developing new statistical theory to solve real biological problems. At NVRS, John developed the theory of *general balance* to provide a unifying framework for the wide range of designs that are needed in agricultural research (see Nelder, 1965, *Proceedings of the Royal Society, Series A*). Then, at Rothamsted, he developed the theory of *generalized linear models* with the late Robert Wedderburn, to overcome the problems of analysing response variables like counts and proportions that do not come from Normal distributions; see the citation classic Nelder & Wedderburn (1972, *JRSSA*) or the book by McCullagh & Nelder (1989).

This idea of directing statistical research at real biological problems began with the two earlier Heads of Statistics at Rothamsted, R.A Fisher and F. Yates, to whom John became such a worthy successor. However, John emphasized an important additional aspect, namely that the new theory should be implemented in widely-distributed statistical software to enable it to become widely used in practice.

The initial aim for John's first statistical program, GenStat, was to provide analysis of variance for generally balanced designs. The underlying ideas took shape in 1965–1966 when John visited the Waite Institute of the University of Adelaide to work with Graham Wilkinson, who was then on secondment there from CSIRO. More intensive development began in 1968 when John joined Rothamsted, and the wider statistical and computing expertise available at Rothamsted allowed him to develop GenStat as a truly general-purpose statistical system. GenStat continues in widespread use today, and is distributed by VSN International to users in more than 120 countries. I was honoured to take over leadership of the GenStat development in 1985, after John's retirement from Rothamsted, and glad that John continued as an enthusiastic (although sometimes critical!) user.

John's other two major contributions to statistical computing came about while he was Chairman of the Royal Statistical Society's Working Party on Statistical Computing (1967-1984). The first, in 1968, was the Applied Statistics Algorithms, which aimed to support good computing practice by providing implementations of the basic building blocks of a statistical program. Later much more complicated techniques were added, and the publication of an algorithm for a new piece of methodology became an equally valid (and perhaps more effective) way of registering a new idea. The second contribution was the program GLIM which first appeared in 1974, with 4 further releases up to the final GLIM4 in 1993. This implemented Nelder & Wedderburn's generalized linear models, and led to a dramatic improvement in the quality of statistical analysis. It had an immense influence on the new generation of practical

statisticians. For many it provided their first experience of analysing data interactively, encouraging them to think about each data set, instead of directing it at a black box with a request for "statistics all".

John retired from Rothamsted in 1984 at the age of 60, but continued his research at Imperial College (of Science, Technology, & Medicine, London) where, since 1972, he had been a Visiting Professor. He retired from Imperial College in October 2009. His first task there was to lead the GLIMPSE project, which was funded by the UK Government's *Alvey* programme to produce a knowledge-based front-end for GLIM. The GLIMPSE system provided advice on data validation, data exploration and model selection. It contained many very interesting and far-sighted ideas and, when it was released in 1989, it was one of the first statistical expert systems to be made available commercially – and perhaps one of the few to deliver what the originators had promised.

John's other major activity at Imperial College was his collaboration with Youngjo Lee to develop the theory of *hierarchical generalized linear models* (HGLMs); see the papers by Lee & Nelder (1996, *JRSSB*; 2001, *Biometrika*; 2006 *Appl. Statist.*) or the book by Lee, Nelder & Pawitan (2006). HGLMs aimed to provide satisfactory methods of analysis for non-Normal data when there is more than one source of random variation. John viewed generalized linear models as a way of liberating statisticians from the "tyranny" of the Normal distribution, and was a little bemused to see this same tyranny reestablished in methods that were devised initially to extend them. These *generalized linear mixed models* (GLMMs) catered for additional random variation by adding additional Normally-distributed random effects into the linear model of the generalized linear model. John and Youngjo's new HGLMs extended the methodology to include the beta-binomial, gamma and inverse-gamma distributions, and showed that the *conjugate* HGLMs (namely binomial GLM with additional beta-binomial random effects, or Poisson with gamma, or gamma with inverse gamma) had attractive advantages in their mathematical theory, computing algorithms and philosophical interpretation. HGLMs can be fitted very efficiently by two interlinked generalized linear models. So we have access to a familiar repertoire of model checking techniques, and can base our choice of models on the data rather than on prejudice or software limitations. Also, the analysis can still be carried out interactively – always a very important consideration for John.

With John's many achievements in statistics, it is important not to forget his other interests. He shared a keen interest in gardening with his wife Mary (nee Hawkes), whom he met and married in 1955 while he was at NVRS; they have a son Jan and a daughter Rosalind. John and Mary were also keen birdwatchers, John combined ornithology with statistics by making a rigorous statistical assessment of the implausibility of the many rarities reported from Hastings during 1892-1930 (the "Hastings Rarities"); this provided convincing evidence for their subsequent rejection (see Nelder, 1962, *British Birds*). Finally he was a very keen musician and a virtuoso piano player, and his musical soirees at his house in Redbourn will be remembered by the attendees with lasting pleasure.

John received many honours during his career. He had a DSc from University of Birmingham, and received an honorary DSc. from Universite Paul Sabatier, Toulouse, in 1981. He was also elected a Fellow of the Royal Society in 1981. He was President of the International Biometric Society from 1978-1979, and was made an Honorary Life Member in 2006. He was President of the Royal Statistical Society from 1985-1986, and was awarded Guy Medals of the Society in Silver in 1977, and in Gold in 2005. He wrote three books and over 120 papers in statistical and biological journals, including two citation classics: the Nelder & Wedderburn (1972, *JRSSA*) paper on generalized linear models already mentioned, and his paper written with Roger Mead while at NVRS describing their now very widely-used adaptive simplex optimization algorithm (see Nelder & Mead 1965, *Computer Journal*).

More important perhaps is his statistical legacy of general balance, generalized linear models, hierarchical general linear models – and GenStat – which will keep him always in our thoughts.

Roger Payne
Rothamsted and VSN International

An extended version of this Obituary, with the opportunity to add your own memories and messages of condolence, is at http://www.vsni.co.uk/featured/john-nelder/