

## Eric Arthur Newsholme (1935–2011)

Eric Arthur Newsholme was born in Liverpool, England, on 19 May 1935 and died in Torquay, South Devon, on 17 March 2011. He was brought up in the Liverpool suburb of West Derby and it was during this period that he started his lifelong devotion to Liverpool Football Club. Eric moved south in 1955, to attend university in Cambridge and later to start his professional research career in Oxford. He was appointed to a Fellowship at Merton College and a Lectureship at the Department of Biochemistry, University of Oxford, in 1973. Eric remained associated with the College and University until his retirement in 1996. Over 50 PhD students and a similar number of post-doctoral scientists received research training in Eric's lab which was located in the Department of Biochemistry, University of Oxford. Past members of the Eric Newsholme laboratory now have their own labs in the UK, Europe, North America, South America, Asia and Australia. Eric published over 300 original research papers, numerous reviews and book chapters: many biochemists will recall how textbooks written by Eric, such as *Regulation in Metabolism* by E.A. Newsholme and C. Start (1973) and *Biochemistry for the Medical Sciences* by E.A. Newsholme and A.R. Leech (1983), provided them with much of their knowledge of intermediary metabolism and metabolic control. To quote Professor Terence Kealey, vice-chancellor of the University of Buckingham, UK, "it was his *Regulation in Metabolism* textbook that so excited me that I gave up medicine for biochemistry. It was a great book: masterful, creative and accessible. Everyone who read it recognized it as a classic." However, it was not entirely one way: for example, Eric found it very touching when a senior Oxford clinician told him that there was not a day on the wards when he did not call to mind the biochemistry that Eric had taught him as an undergraduate at Oxford. Eric recently updated *Biochemistry for the Medical Sciences* to become the textbook *Functional Biochemistry in Health and Disease* with Tony Leech (2010), which was written to enlighten a new generation of medical and health science students to the beauty and relevance of biochemistry. Eric had the pleasure of presenting a copy of the latter textbook to his granddaughter Sinead, who is currently studying medicine in UCD Dublin, in May 2010.

Eric Newsholme read Natural Sciences at Magdalen College, University of Cambridge and, following his undergraduate degree, completed a PhD in Biochemistry under the supervision of Sir Philip Randle. Eric published his first full paper in the *Biochemical Journal* in 1961 (on the regulation of glucose uptake by muscle) with Philip Randle. This was the first of over 100 papers Eric published in the *Biochemical Journal*, and around 20 of these have gone on to be recognized as seminal papers by the research community. During his PhD, Eric went on to publish four more papers on the metabolism of fatty acids, ketone bodies, glucose and pyruvate by muscle, two of which were published in *Nature* in 1962 and 1963 and two in the *Biochemical Journal* in 1964. These papers expanded on the data published by Randle, Garland, Hales and Newsholme in *The Lancet* in 1963 ('The glucose fatty-acid cycle: its role in insulin sensitivity and the metabolic disturbances of diabetes mellitus'), and each contributed to, and added substantial support for, the so-called 'Randle hypothesis' or 'Randle cycle', a regulatory mechanism still hotly debated today, given its relevance to diet, obesity and Type 2 diabetes<sup>1</sup>.

In Eric's subsequent career as an independent scientist, he set out to make major research contributions to at least three research areas: (i)



The E.A. Newsholme group (c. 1986)



(Left to Right) Eric and Pauline with grandsons Aodhan and Rory Newsholme (July 2010)

mechanisms of metabolic regulation in muscle, (ii) metabolic adaptations to exercise, and (iii) nutrient control of immune cell function. Perhaps Eric's key contribution was to bring to each of these topics a desire to provide quantitative descriptions of complex metabolic pathways, and to consider metabolic control in terms of the biochemistry and physiology of the whole organism, not just the cell/tissue in which the study was conducted. In many respects, this makes Eric Newsholme a forefather of the re-emergent field of systems biology<sup>1</sup>.

Eric perhaps made his most significant impact through undergraduate teaching, textbooks, articles in sports magazines and personal interest in the biochemistry of exercise (he took up marathon running in his mid-30s and successfully completed around 40 marathons, passing on his enthusiasm for this sport to his wife!). As a consequence, he has contributed to a greater appreciation of energy metabolism by scientist and sportsman alike. His final project, uncompleted, was a major text on the scientific basis for outstanding human physical performance in football.

In all of his activities, he was supported by his wife Pauline, whom he married in 1959. His wife, his son Philip and daughters Glenda and Clare survive him. ■

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1. Past times 'Reflections of a metabolic biochemist: Eric Arthur Newsholme' *The Biochemist*, October 2006