

SIR JAMES BADDILEY



Jim Baddiley was born in Manchester, descended on his father's side from a farming family, and was one of four children. His father, also James, had broken with family tradition and become a scientist, an industrial organic chemist, who for many years was director of research of ICI Dyestuffs in Blackley, Manchester. Jim attended Manchester Grammar School, with no specialisation until the sixth form, and he has said that his family life was very happy with no academic pressures on him. He spent his pocket money carrying out chemical experiments at home with the encouragement of his father, and he realised that chemistry and biology were the subjects which most interested him. He entered Manchester University to read chemistry in 1937 and in 1938 a young Alexander Todd succeeded Ian Heilbron as Professor of organic chemistry. Alex proved to be an important influence on Jim's future career.

After graduation, Jim became one of the first research students to work with Alex Todd and Basil Lythgoe on the synthesis of nucleosides. The long term objective of this programme was the synthesis of nucleotide coenzymes and components of nucleic acids, and led eventually in Cambridge to Todd's Nobel Prize in 1957. After gaining his PhD, Jim moved to Cambridge with Todd in 1944 and embarked, as an ICI Fellow, on the synthesis of adenosine triphosphate (ATP); a very ambitious undertaking. Writing in *Pembroke College magazine* in 2008 he recalled the thrill of walking down *Pembroke Street* shortly after the completion of the synthesis. While in Cambridge, unlike his chemical colleagues, he established contacts in the Department of Biochemistry particularly with Kenneth Bailey and Ernest Gale, and attended colloquia and seminars in the Department.

After further postdoctoral work in Sweden, Jim returned to Cambridge in 1949 and was offered a staff appointment at the Lister Institute of Preventive Medicine in London, giving him his first research independence. In August 1949 the first International Congress of Biochemistry was held in Cambridge, bringing together the world's biochemists for the first time since the war. One of the main lectures was by the German American biochemist Fritz Lipmann announcing the discovery of a new coenzyme, coenzyme A, which he showed was a derivative of pantothenic acid, one of the B vitamins. Jim met Lipmann, who asked him for his help in determining the full chemical structure of coenzyme A. This was an ideal collaboration and, in London, Jim soon built a small research group to study this and other problems related to coenzyme structure. Within three years he and Malcolm Thain, together with Lipmann, had solved the problem. By this time the Lister group had expanded and achieved syntheses of the coenzymes codecarboxylase and active methionine.

As an extension of the coenzyme A work Jim explored, with Tony Mathias, the way in which coenzyme A was formed in bacteria and found that nucleotides were also present in the bacterial extracts which interfered with their experiments. Further exploration of this chance observation led to the isolation of two new nucleotides with unusual properties. In due course this led him into a field of biology which occupied him for the rest of his life.

At this stage Jim was appointed Professor of Organic Chemistry at Kings College Newcastle, then one of three components of Durham University. The determination of the structure of the unknown nucleotides became the major research interest, and by 1956 Arnold Sanderson and Beverley Carss showed them to be cytidine derivatives of glycerol phosphate and ribitol phosphate. The question now

arose as to the biochemical role of these nucleotides - it had been shown that similar nucleotides were involved in the formation of polymers of high molecular weight. A senior American biochemist Bob Greenberg was a visitor in the Department. With some scepticism he undertook to prove the existence of polymers of glycerol and ribitol phosphate in bacteria and within a few days, to his surprise and delight, had produced positive results. These polymers were later shown to be associated with bacterial cell walls and membranes of Gram positive bacteria. With his usual thoroughness, Jim consulted the Professor of Greek, Professor Hudson-Williams, to find a suitable name. Teichos is the Greek word for a fortified wall and the polymers were named teichoic acids.

Jim then began an extensive investigation of the teichoic acids, showing that they contained sugar components and the amino acid D-alanine. He studied their structures, their biosynthesis, which involved the cytidine nucleotides, their immunology and most importantly the part they played in the functioning of the bacterial cell. Many people contributed to this programme over a period of years - Ron Archibald and Ian Hancock deserve special mention. Jim realised that his researches were taking him out of the mainstream of organic chemistry and he became Professor of Chemical Microbiology, eventually in a separate building. Since 2004 the Centre for Bacterial Cell Biology has been established in Newcastle under the direction of Jeff Errington and the work on teichoic acids continues. A Baddiley Lecture has been established and Jim himself was able to be present at the inaugural lecture by Sir John Walker in 2008.

Jim was elected to the Royal Society in 1961 and to the Royal Society of Edinburgh in 1963: he was knighted in 1977. He has been awarded many prizes and lectureships and received honorary degrees from Heriot-Watt and Bath Universities. Although Alex Todd was a major influence in his life, Jim was much more interested in biological aspects of chemistry and felt at home in the company of biochemists and biologists. He used his chemical skills to unravel major problems in biology and believed that it was easier for a chemist to acquire the necessary knowledge of biology than the other way round. He was determined and single-minded, as befits a rock climber, one of his activities as a young man.

Jim Baddiley's marriage in 1944 to Hazel Townsend was a mainstay in his life. He was interested in the arts and in music. Hazel had been a textile designer, they had much in common and she gave him great support. Shortly after moving to Newcastle, Jim and Hazel built a new house which gave them both great pleasure in the planning and furnishing. Their son Christopher, born in 1947 in Cambridge, has distinguished himself as a physicist and astronomer. Christopher is well known as a lecturer and has won the Galileo medal for his work on urban light pollution in astronomy.

When Jim and Hazel retired they moved to Cambridge and Jim re-established his friendship with Sir Hans Kornberg. He became a Fellow of Pembroke College and carried out research in the Department of Biochemistry. He helped to found the Institute of Biotechnology in Cambridge and served on a number of University and national committees. Even after retiring for the second time his interest in teichoic acids continued, especially the part played by the alanine groups in relation to the metals magnesium and calcium. He published a paper on his own in 2000, and an extensive review with Frank Neuhaus in 2003.

J Grant Buchanan

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