Lloyd Arthur Stocken (1912–2008)

Courtesy of St Catherine's College Oxford

Robin Irvine (University of Cambridge)

Lloyd Arthur Stocken, who died on 26 September 2008, was Reader in Biochemistry at the University of Oxford and a founding Fellow of St Catherine's College. Born on 30 January 1912, he was brought up, with his sister Marcia who survives him, in Nottingham. He attended Nottingham High School and then worked for Boots as a synthetic chemist, taking an external BSc in Chemistry at Nottingham University in 1934. In 1937, he was appointed as a Nuffield Assistant in the Oxford Biochemistry Department, and the following year matriculated as a Research Student into the St Catherine's Society (before it was a College).

In 1939, Lloyd was recruited to join a team at Oxford led by Professor (later Sir) Rudolf Peters, who had been charged by the Ministry of Defence with a crucial mission. The use of gas in warfare during World War One had left a grim spectre, now resurrected by the malevolence of Hitler. It had become urgent to obtain antidotes to these dreadful agents. One such gas was lewisite ($CHCl=CH.AsCl_2$), a vesicant (blister-forming agent) that had been (re)-synthesized by an American synthetic chemist, Captain W. Lee Lewis, in 1918; fortunately too late for its use in World War One. However, in 1939, known as the 'dew of death' (Lewis called it "the stuff beside which mustard gas becomes a sissy's scent!"), it was once again a terrifying threat.

Earlier work had established the likely target of lewisite to be pyruvate metabolism, possibly by its action on –SH groups. But when it was discovered that near toxic concentrations of thiol compounds such as glutathione were needed to neutralize lewisite, this avenue of research was abandoned. Fortunately, Lloyd and his colleague Robert Thompson both possessed that essential characteristic of a good scientist — the ability to ignore instructions — and they continued to work on the –SH idea on their own. Their search for a suitable thiol-containing protein that they could obtain in a pure form, and in large quantities, led them to kerateine, which they prepared from keratin extracted from hair (obtained from local barbershops). The high efficacy of kerateine in reacting with lewisite, together with the dominant presence of dithiol compounds in the reaction products, led them to the inspired idea that a close spatial apposition of more than one –SH group in kerateine might be the key to its reactivity.

So, by an elegant piece of chemical logic, they explored dithio compounds that contained spatially close –SH groups. This criterion, plus a requirement for a compound that skin would absorp readily, eventually led them to 2,3-dimercaptopropanol, which did exactly what was needed. Under the name of British anti-lewisite (BAL), this later became a useful antidote for the toxicity of arsenic used in agricultural or medical practice (the latter case for the treatment of syphilis), and also to counteract some other heavy metals such as mercury. But of course its original intended function as an anti-lewisite was, mercifully, never called upon. None of this superb work was published until after the war, when the Ministry of Defence finally gave approval for its dissemination[1–4], though Lloyd did receive recognition in 1944 in the form of his election as a Fellow of the Royal Institute of Chemistry and receipt of its Newton Chambers Prize.

He continued to work on BAL into the 1950s, extending the repertoire of its uses. The actual target of arsenicals, lipoic acid, which is central to pyruvate metabolism, was finally discovered in 1951. The German scientist I.C. Gunsalus visited Oxford the following year *en route* to a conference and courteously informed Lloyd "We have found your dithiol!". At this time there was (understandably) a great interest in the effects of radiation on living systems, and Lloyd began an extensive and important programme of research in this area, funded by the MRC. As he started this enterprise,

which included writing a seminal review on the subject[5], he was joined by Dr Margery Ord, and thus began a scientific partnership that lasted until his death. More than half of all his publications were co-authored with Margery, including in later years, an important series of books and articles on the history of biochemistry.

One of the directions in which their studies took them in the 1950s was into the phosphorylation of proteins, and how it was affected by radiation, which in turn led them to look at the nucleus. Here they made a remarkable discovery: histones are phosphorylated[6], and this phosphorylation changes dramatically during the cell cycle[7]. Although the long interval between discovery and publication led to them being 'scooped', the truth is that this seminal finding belonged to Lloyd and Margery, and to them alone. Nuclear biochemistry and radiation continued to be their principal focus until they stopped lab work when Lloyd was nearly 80[8], and subsequently concentrated on their historical studies.

Through much of Lloyd's life, tennis was a passion, and during his younger days in Nottingham billiards was more than that — he always maintained that at that time he supplemented his meagre income by using his skill on the green baize. He was also an accomplished wildlife photographer, and an enthusiastic gardener always on a quest for the perfect sweet-pea. However, the centre of his life outside science was his family. He married Noreen, also from Nottingham, on Christmas Eve in 1939, and they had a son Robert and a daughter Jenny; he leaves six grandchildren and seven great-grandchildren. Noreen died in 2004, but Lloyd continued to live in the family home, regularly cooking favourite dishes such as calves' liver and onions. He and Noreen had honeymooned in the Yorkshire Dales and in 2007 he returned there with Robert, together with his daughter-in-law, Gloria, and Margery, to confirm that the 'Isaac Walton' hostelry was still as good as it had been nearly 70 years before.

Tutorials with 'Lloyd Arthur' were always a relaxed affair, held either in the 'Lamb and Flag' pub or in his rooms in St Catherine's, where they usually involved sherry, and often included him leaning back in his chair and scratching his head in a highly characteristic way, and telling us the trials and tribulations of the experiments he was doing, with the difficulties of their interpretation: we learned more about how science really works from these musings than we ever did from textbooks or lectures. Well into his 90s, he cycled up and down Banbury Road, pedals going as always at a furious rate — we were never sure if his bike was stuck in low gear or if he had some theory about getting maximum exercise within the minimum distance. He was, in his own inimitable way, a great *bon viveur* and for members of his lab regular wine brews were a part of the routine. For students who attended dinners organized by him, his expertise became legendary for mixing punches with a taste like ambrosia and a kick like a mule.

Lloyd always seemed to be ageless and indestructible, but of course he was neither, and his passing marks the ending of an important chapter in British biochemistry. ■

References

1. Peters, R.A., Stocken, L.A. and Thompson, R.H.S. (1945) Nature **156**, 616–619
2. Stocken, L.A. and Thompson, R.H.S. (1946) Biochem. J. **40**, 529–535
3. Stocken, L.A. and Thompson, R.H.S. (1946) Biochem. J. **40**, 535–548
4. Stocken, L.A. and Thompson, R.H.S. (1946) Biochem. J. **40**, 548–554
5. Ord, M.G. and Stocken, L.A. (1953) Physiol. Rev. **33**, 356–386
6. Ord, M.G. and Stocken, L.A. (1966) Biochem. J. **98**, 888–897
7. Ord, M.G. and Stocken, L.A. (1968) Biochem. J. **107**, 403–410
8. Skouteris, G.G., Ord, M.G. & Stocken, L.A. (1989) FEBS Lett. **245**, 155–158

The Biochemical Society regrets the deaths of the following members in 2008:

Professor James Baddiley
Dr Henry B.F. Dixon
Dr Derek E. Dolby
Professor Leslie Fowden
Professor Brian M.J. Foxwell
Dr Darrel E. Goll
Professor T.W. Goodwin
Dr D.E. Hathway
Professor Bernard H Howard
Dr Allen C. Jennings
Professor Irving M. Klotz
Dr G.H. Smith
Professor B.A. Stone
Professor C.F. Strittmatter
Professor Ed Wood