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Nobel Laureate 1952

R L M Syngé was elected FRSE in 1963. He was born in West Kirby, Cheshire, on 28 October 1914, the son of Katherine (née Swan) and Lawrence Millington Syngé, a Liverpool Stockbroker. The family was known to be living in Bridgenorth (Salop) in the early sixteenth century. At that time the name was Millington and there is a story that a member of the family from Millington Hall in Rostherne (Cheshire) sang so beautifully before King Henry VIII that he was told to take the name Syngé. There have been various spellings of the name and in the nineteenth century the English branch settled on Sing which they retained until 1920 when both R M and L M Sing (Dick's uncle and father respectively) changed their names by deed poll to Syngé. In the 19th and 20th centuries the Sing/Syngé family played a considerable part in the life of Liverpool and Dick's father was High Sheriff of Cheshire in 1954.

Dick was educated at Old Hall, a prep school in Wellington (Salop) and where he became renowned for his ability in Latin and Greek, subjects which he continued to study with such success at Winchester that in December 1931 when, just turned 17, he was awarded an Exhibition in Classics by Trinity College, Cambridge.

His intention was to study science and Trinity allowed Dick to switch from classics to the Natural Sciences Tripos. To prepare for the change he returned to Winchester in January 1932 to study science for the next 18 months and was awarded the senior science prize for 1933.

Just before going up to Trinity he decided to study biochemistry and gave his reasons in his Nobel lecture: 'It was particularly reading in the newspaper Sir Frederick Hopkins' Presidential address to the British Association in 1933 that impressed on me the idea that living things must have wonderfully precise and complicated working parts on the molecular scale and that the biochemists had the best chance of finding how these things are put together and do their work. As I was to begin studying natural science at Cambridge University in the same year, the ambition of studying in Professor Hopkins' laboratory could easily be realised'.

He read chemistry, physics and physiology for Part I of his Tripos; intending biochemists took the Part I course in physiology as this contained a substantial amount of 'physiological chemistry' taught by the staff of the biochemistry department. The practical component of the course was presided over by Sydney W Cole, Hopkins' collaborator in the discovery of tryptophan. It was here that I first observed Dick - a large well-built man with a broad face, small twinkling eyes and a mass of mouse-coloured hair brushed down over a massive forehead and who always seemed surrounded by a group of students engaged in animated discussion. I first met him in October 1935 when the Part II biochemistry class assembled to meet the Professor, Sir Frederick Hopkins, who said he was pleased to see us and invited us to join the staff and research workers at tea each day. The department itself was an exciting place containing an assembly of talented diverse personalities including Joseph and Dorothy Needham, Marjory Stephenson, Malcolm Dixon, Bill and Antoinette Pirie and Robin Hill. There was in addition a number of distinguished German biochemists - E B Chain, Ernst Friedemann, H A Krebs and H Lehmann. The politics were left-wing and the journals in the tea room ranged from the *Daily Worker* and the *New Statesman* to the *Times* and the *New Yorker*. There was strong support in the department, as there was throughout Cambridge, for the anti-war and anti-fascist movements and Dick entered these with an enthusiasm for the peace movement which never left him.

By the Spring of 1936 Dick had made up his mind to study proteins. As expected, he was head and shoulders above the rest of us; he obtained a first class degree and began research under Pirie in September 1936. Pirie suggested that Dick should study glycoproteins. Dick read the available literature and realised that he had neither the knowledge nor the practical skills to undertake a research which involved both carbohydrate and protein chemistry. To rectify this he decided to work for a period with D J Bell, a carbohydrate chemist, whom Hopkins had recently appointed as a lecturer in biochemistry. 'Wee Davie' as Bell was affectionately known, was a graduate of Glasgow University and he, along with Ernst Friedmann, were the main sources of advice on organic chemistry in the department. Dick then proceeded to show, using the extraction techniques he learned from Bell, that it was possible to make significant separations of N-acetyl amino acids.

In 1937 there was working in the same room as Pirie and Dick a large Australian, Hedley R Marston, Director of the Nutrition Laboratory in Adelaide: he was also connected with the International Wool Secretariat which he had persuaded to fund research on the chemistry of wool, and he was on the look-out for someone to undertake this research. He soon realised that Dick would be appropriate and consulted a distinguished Australian, Sir Charles Martin (then working at the Dunn Nutrition laboratory in Cambridge) the UK scientific adviser to the International Wool Secretariat, and as a result Dick was awarded a scholarship to study the chemistry of wool.

In the mid thirties Sir Charles worked with Archer Martin (no relation), an expert on counter current methods. Perceiving the relevance of Archer's expertise to Dick's results, he arranged for them to meet and then to collaborate. As a boy Archer had become interested in separation techniques and had made distillation columns by soldering cocoa tins together and packing them with graded coke. And at the Dunn laboratory he had purified vitamin E using glass counter current apparatus which he had both designed and made. This coming together proved so fruitful that Martin and Syngé shared the Nobel Prize for Chemistry in 1952.

Archer, who by now was working at the wool research laboratory in Leeds, designed a counter current apparatus to work with Dick's solvents. It was built in the biochemistry workshop and performed according to theory. In 1939 Dick moved with the apparatus to Leeds and as Archer said in his Nobel lecture 'we were able to determine the more fatty amino acids in wool with much greater accuracy than had been done before.' The apparatus was cumbersome, temperamental and unpleasant to use and after much thought they developed the simple, efficient, silica gel partition chromatogram which gave good separations of the amino acid derivatives.

Soon after this, with Consden and Gordon, they introduced the equally efficient paper chromatogram and thus within two or three years biochemists and chemists were provided with analytical tools of extraordinary power and influence.

Throughout his work Dick kept A C Chibnall fully informed on progress and this enabled his group to make the first quantitative analysis of a protein, insulin. Dick and Archer with Consden and Gordon then began to explore possible methods for establishing the sequence of amino acids in proteins using the chromatographic methods they had developed - a problem taken up and brilliantly solved by Sanger who made extensive use of silica gel partition chromatography. The antibiotic peptides gramicidin and tyrocidin were examined and the constituent amino acids determined. Later, when gramicidin S, a cyclic decapeptide isolated by Russian biochemists, became available, it too was analysed.

In 1943 Dick married Ann Stephen whom he had known in Cambridge and they set up house in Leeds. Later in the year Dick was offered a post at the Lister Institute and he and Ann moved to London. At the Lister, Dick established the structure of gramicidin S, and to obtain the ultimate structure he prepared crystals for his friend Dorothy Hodgkin to examine by X-ray crystallography. Working with her at that time was a fourth year Oxford chemistry student, Margaret Roberts, who became involved in the gramicidin work. Years later, when Margaret Thatcher became famous, Dick used to refer to her as his first student. At this time he also developed the potato starch chromatogram for the separation of amino acids. In 1946-47 he went to Uppsala to work with Tiselius on separation techniques and it was whilst there that he and Ann learned to ski.

In late 1947/early 1948 Dick said he was thinking of working at the Rowett Research Institute. I replied that the senior staff there were very good and that the prospects for research with David Cuthbertson and Andrew Phillipson were excellent. Thus in 1948 Dick moved to the 'mud on the boots' world of agriculture. He believed that it was not the subject on which one researched but the quality of that research which counted, and that in his view the study of the food of farm animals was worthy of as much effort of the study of the chemistry of gramicidin S.

From his early days at Leeds Dick had become very close to Chibnall and recounts how Chibnall invited him to dinner at the Café Royal in London to discuss his impending move to Cambridge. Not surprisingly, Dick sought the advice of Chibnall, a powerful man in the ARC, about his future work at the Rowett. Chibnall urged him to study non-protein nitrogenous compounds in leaves. Dick defined this topic as 'substances containing amino acid residues chemically bound other than in proteins'. He collaborated with Cuthbertson and Chalmers on the utilisation of various proteins and protein supplements by pregnant ewes on a low plain of nutrition.

He spent 1959 in New Zealand at the Ruakura Animal Research Station where he took part in a programme of research on the cause of facial eczema in sheep. It was known that a fungus, *Sporidesmium bakeri* was involved and that infected pasture contained a toxic material. Together with E P White he isolated from culture medium, in which the fungus had grown, a highly toxic compound which they named 'sporidesmin'.

In 1967 he transferred from the Rowett to the ARC Food Research Institute which was adjacent to the University of East Anglia and on the site selected for the John Innes Institute. The University made him an Honorary Professor. At the Institute he continued his studies of the reactions of quinones with proteins and amino acids in plants and of the bound forms of amino acids.

The organic chemist, Professor R D Haworth, with whom he shared an interest in the amino acids bound to humic acid once observed - 'you know Elsdon, Syngé is better than Beilstein on amino-acids'. He always started a piece of work by mastering the relevant literature and the extensive reading continued whilst the work was in progress. This meant first, *American Chemical Abstracts*, then *Science Citation Index* followed by visits to various libraries to read the original papers - visits carefully planned and so organised that a number of objectives were met by one journey. Thus, a library visit to Cambridge would be timed to coincide with a feast at Trinity - he was made an Honorary Fellow in 1972. During his time in Cambridge he would, apart from the library visits, take lunch in the Pantin Arms, walk round the Botanic Garden - a place he loved and where his ashes were scattered - have tea with Chibnall and before leaving take a glass of malt with his old friend.

On his retirement the University of East Anglia awarded him an HonDSc and the School of Chemical Sciences provided him with an office and free access to the University computer facilities. His life-long study of the chemical literature made him increasingly aware of the pressing need to store and retrieve chemical information rapidly, and he became an active member of the Chemical Information Group of the Royal Society of Chemistry. His last research paper, entitled - 'Substructure searching of heterocycles by computer generation of potential aliphatic precursors', was published in 1985 when he was 70. Finally, in 1986 he read a paper to a conference of the Chemical Information Group in which he made a critical appraisal, based on his own experience, of a number of years' use of *Science Citation Index* and the on-line computerised *American Chemical Abstracts* for the retrieval of references. Throughout 50 years of research there was no slackening of intellectual activity - retirement only meant a cessation of experimental work.

Observing Dick over some 60 years I have come to appreciate that two of the principles which guided him were orderliness - he often quoted to me 'ordnung muss sein' - and probity. At first sight on an ordinary day, he appeared somewhat sloppily dressed - a large tweed jacket, shoes which had seldom seen polish and if in town a rucksack on his back. Walking thus he had that faraway look of someone who was not in this world - he was of course deep in thought. He had a powerful intellect coupled with a remarkable memory and everything he did, save on special occasions, was thought through and highly organised. He seldom wasted a minute - thus if one was late for a luncheon engagement Dick would be there, writing in his notebook with a glass of beer to hand. As soon as one arrived the notebook would be put away and conversation began.

The same orderliness was seen during walking weekends. The journeys would have been planned in detail and no matter the walk was in the Scottish hills or the Yorkshire Dales there would be a running commentary on the

geology and the plants - he never appeared much interested in animals. He had a detailed knowledge of the railway system in its prime and of the timetables. He had a great love of travel and he and Ann made many journeys together in many parts of the world. The most remarkable of these was the family's return from New Zealand in November 1959. There were nine in the group - Dick, Ann and seven children. They went by boat to Hong Kong and then overland to Peking where they took the Peking to Moscow train via Mongolia, a journey of some 5000 miles described by Dick in an article in the *Railway Magazine*.

His background in Classics gave him an enduring interest in and a knowledge of both languages and linguistics. He was fluent in German, Russian and Swedish and he gave his Nobel Prize lecture in Swedish - indicative of his sense both of propriety and of politeness to his host - it was what one would expect of a man who fully lived up to the motto of Winchester College 'Manners Makyth Man'.

Dick worked actively for peace from his undergraduate days and throughout their married lives he and Ann never spared themselves in this endeavour. They were not ostentatious figure heads; rather they played active administrative parts and, in the case of the Norwich Peace Council, Ann was Chairman and Dick Treasurer. They invariably took their turn on the peace stall on Norwich Market and these two tall figures behind the counter were an imposing sight on a Saturday morning.

He was a member of the Pugwash movement and he signed the 1982 Pugwash Declaration on the dangers of nuclear war. He never forgave the US for developing or Truman for using the atomic bomb. But it was not just for the death and destruction that the use of the bomb caused that he opposed nuclear developments. Tam Dalyell put Dick's position succinctly when he wrote in the *Independent* - 'To say Syngé was obsessed by Hiroshima and Nagasaki, . . . would be to miss the point that he foresaw the dangers of nuclear radiation at an earlier stage and more clearly than most of his contemporaries'.

When they moved to Aberdeen they bought a large house on the cliff edge at Muchalls where they brought up their children. Ann and the children sailed in summer and in winter the whole family skied. Throughout the year they walked the Scottish hills and there was no better guide than Dick. For the first time in their married life they had a garden which Dick developed for vegetables, improving the soil with loads of seaweed carried up the cliff from the beach below. Ann became a Kincardineshire County Councillor and at the same time, helped by Dick, took up the translation of Russian scientific books, the most important of which was the Third, enlarged, edition of Oparin's *The Origin of Life on the Earth*.

When they moved to Norwich they bought a house with a large garden and because of the more clement climate Dick was able to grow apples and asparagus in addition to the crops that did well in the north east of Scotland. He was always a good cook and in later years as Ann became less mobile, Dick took on the running of the house which included both the cooking and the shopping. Unfortunately he too became unwell. First he developed gout but, before accepting treatment he read the literature. Allopurinol was prescribed but since this meant dependence on the drug for the rest of his life he decided to control the condition by a diet which maintained an alkaline urine - this self-disciplined treatment was successful.

But gout was the least of his troubles for he developed both temporal arteritis and then myelodysplasia. The former was kept under control by a daily if decreasing dose of a corticosteroid. This dependence greatly irritated him but there was no alternative treatment. The latter condition was much more serious. For a number of years it was kept under control by regular visits to the hospital for a transfusion of red cells and he was able to continue to run the house though the beloved garden became beyond him.

The fortitude with which he carried on over a number of years astonished his friends. During the last year he became slower and more obviously ill and in the end, as a result of the developing myelodysplasia, his resistance gave way and he went into hospital for treatment of an infection. When he came home he was obviously very weak but he still continued discussing objectively the details and nature of his condition with both his doctor and the consultant who were treating him. Before leaving him on what proved to be my last visit I asked if he would like me to come and read to him. Independent to the last he replied 'No, I have my memories; so many of them beautiful', and as I left the room I thought: 'and so have I Dick, so have I'. He died peacefully on August 18th 1994.

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*(This is an abridged version of a fuller appreciation, copies of which can be obtained on request from the Fellowships Office.)*