

RALPH ALEXANDER RAPHAEL

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With the death of Ralph Raphael, synthetic organic chemistry has lost one of the most able, original, charismatic and universally loved practitioners and teachers of his generation.

Ralph's outstanding intellect, his unique ability to absorb, retain and recall information – he could truly be described as a walking encyclopaedia of organic chemistry – found application in devising ingenious, elegant and economical syntheses of a long succession of biologically active natural products. His generosity in response to fellow scientists seeking advice or help is well known.

Ralph Alexander Raphael was born in Croydon on 1 January 1921, the son of a Jewish master tailor. His early education during the depression years was fragmented due to his father's need to seek work wherever available, causing the family to move from London to Leeds, Sunderland and then to Dublin, where Ralph started his secondary education at Wesley College. At that time he planned to become a rabbi and concentrated his efforts on arts and languages. However, after returning to London, the inspiring teaching of Edgar Ware at Tottenham County School aroused his interest in chemistry and Ware encouraged him to enter for the London Collegiate and Royal Scholarships. He gained both and entered Imperial College in October 1939. Call-up was deferred for science students and he succeeded in completing his degree in 1941, one of five students to gain first class honours; he won the Hofmann Prize for distinction in organic chemistry. Continuing at Imperial College, he gained his PhD also in just two years. In this work under the direction of I Heilbron and E R H Jones, aimed at the synthesis of Vitamin A, he made novel use of the reactivity of acetylenes, a topic which was to dominate his interests throughout his career.

The years 1943-46 were spent as head of the chemotherapy research unit of May & Baker, working on the chemistry and synthesis of penicillin and achieving the first synthesis of penicillic acid. The next three years saw him back at Imperial College, having gained one of the newly established ICI Fellowships, and thus able to develop his independent research interests. During this time he initiated studies on carbohydrate synthesis which were to lead to first syntheses of erythulose, apiose and cordycepose, and a synthesis of 2-deoxyribose. Exploiting acetylene chemistry and collaborating with Franz Sondheimer, he achieved the first syntheses of linoleic acid and of geometrical isomers of the naturally occurring insecticides herculin and pellitorine.

Recognition of his brilliance in research came when he was awarded the highly prestigious Meldola medal of the Royal Institute of Chemistry in 1948. During this time at Imperial College, having married the violinist and violist Prudence Gaffikin in 1944, he was likely to be found in the chemistry library in the evenings, surrounded by journals while also minding his baby son Tony.

Ralph first came to Scotland in 1949 when he was appointed to a lectureship at Glasgow University. Here he continued his acetylene based syntheses (e.g. of histamine), while also collaborating with J W Cook on the synthesis of the highly distorted hydrocarbon 4,5-dimethylphenanthrene and of tropolone as well as its naturally occurring isopropyl derivatives (the 'thujaplicins' or 'hinokitiols') which had been isolated by Holger Erdtman from *Thuja plicata* and independently by Tetsuo Nozoe from related Japanese conifers. Here he also established his reputation as an excellent teacher and lecturer. Much to the surprise of anyone who only knew Ralph socially, he developed a stammer when lecturing; but he soon learned to control this so that he could use it to add emphasis and thus actually turned it to his advantage.

After five years at Glasgow, he was appointed as the first Professor of Organic Chemistry at the Queen's University of Belfast. He relished the task of building a new department. In the brief span of three years which he spent there, he succeeded in gaining for the department a considerable reputation. Publication of his excellent book *Acetylenic Compounds in Organic Synthesis* (Butterworths 1955) enhanced his own already high reputation and encouraged synthetic organic chemists worldwide to utilise the many excellent methods which he and his contemporaries had developed during the preceding decade. It was no great surprise, therefore, when he was recalled to Glasgow to the Regius Chair of Chemistry, which had previously been occupied by J W Cook (1939-1955) and briefly (1955-1957) by D H R Barton.

This second Glasgow period was to last from 1957 to 1972, a fifteen year period during which he published a large number of synthetic and other studies, mainly devoted to biologically active natural products. Highlights included syntheses of D-(-)-shikimic acid, cuparene, 'queen bee substance', clovene, *trans*-chrysanthemic acid, and trichodermin. He encouraged and collaborated closely with his staff, not only in building up a thriving research school, but also in ensuring the excellence and topicality of the undergraduate courses. It was a time during which the department gained almost certainly its highest reputation ever. Many students benefited from the stimulating atmosphere and went on to distinguished careers in the British chemical (especially pharmaceutical) industry, among them his own son, Tony, and in academia.

During this time, he was elected first to the fellowship of our own society (1958) and in 1962 to that of the Royal Society (London), awarded the Tilden Lectureship of the Chemical Society (1960), gave invited lectures at Universities in New

Zealand and enjoyed visiting professorships at the University of the West Indies and the Technion, Haifa. He served the Chemical Society as a member of Council and as Vice-President (1963-66) and served as a member of the Academic Planning Committee and Advisory Board of Warwick University (1962).

Ralph Raphael's final move was to Cambridge, to the Chair of Organic Chemistry and Headship of Organic and Inorganic Chemistry in succession to Lord Todd, and to a Fellowship of Christ's College. Although the department had a reputation unrivalled in the UK, attained under Todd, his long tenure had left it ready for many changes which Ralph was able to make, at the same time rebuilding a thriving research school with newly appointed younger staff. Inevitably, his position led to many demands on his time by bodies outside the University. Thus, he served as President of the Organic Chemistry Division of the Royal Society of Chemistry (1977-81), as a member of Council of the Royal Society (1975-77) and as a member of the Scientific Advisory Committee of the National Gallery (1986-98).

Such duties did not detract from his continuing researches which led to syntheses of such diverse compounds as the macrocyclic antibiotic pyrophorin, the germination stimulant strigol, the antileukaemic lignan steganacin and the related (-)-steganone, the antibiotics pseudomonic acid and staurosporinone and the antiviral virantmycin.

Recognition of his important contributions included the Chemical Society's Pedler Lectureship (1973) and Ciba-Geigy Award for Synthetic Chemistry (1975), the Royal Society's Davy Medal (1981), CBE (1982), honorary doctorates of the Universities of Stirling (1982) and East Anglia (1986) and the Queen's University of Belfast (1989), Honorary Membership of the Royal Irish Academy (1987) and the Fellowship of Imperial College (1990). He was Visiting Professor at the Hebrew University, Jerusalem, for a term in 1981, and other invitations to lecture, including Visiting Professorships at the University of Hong Kong (1989) and the Université de Haute Alsace, Mulhouse (1990), were spread over four continents and continued well after his retirement from the Cambridge chair on reaching the age limit (67) in 1988. Although this left him without opportunity to continue research, his active interest in synthetic chemistry and his consulting work, never ceased.

An unrelated contribution which gave him much pleasure resulted from the approach of the Cambridge luthier David Rubio. Analysing the factors which control the sound of string instruments enabled him to devise a filler or 'ground' (applied before the varnish) which permitted Rubio to make instruments closely approaching the quality of the 17th century Cremona violins, violas, and cellos. Ralph and Prudence gave several joint lectures about this work: he talking about the technical side and she providing the musical illustrations on the violin.

Throughout his academic career, Ralph spared no effort to ensure that both his own and his staff's teaching was of the highest quality. He had a well-deserved reputation as a lecturer, whose presentation was always both stimulating and entertaining as well as a model of clarity. When invited by student chemical societies, he was likely to deliver a lecture which started quite seriously, but almost imperceptibly transformed into a spoof. Some of the ideas introduced as phantasy on such occasions – eg chain-like molecules built of interlocking rings, have more recently proved to have been prophetic and even become favourite research topics. Ralph's sense of fun pervaded his domestic and social life; his wide circle of friends appreciated his wonderful sense of humour and his seemingly inexhaustible fund of stories over a wide range of subjects, including the latest Jewish joke. None could ever be bored in his company. He read voraciously and was keenly interested in the visual and performing arts, with a special fondness for opera, passions which he shared with his devoted wife Prudence. After a gourmet dinner, bridge was his favourite pastime: on special occasions games might continue until breakfast.

Ralph died of a massive heart attack on 27 April 1998. He will be greatly missed by his wife, without whose unflinching support and attention to his every need his life would be unthinkable, by his son Tony and daughter Sonia, two grandchildren and a great-granddaughter as well as three sisters, to all of whom he was deeply devoted.

PETER L PAUSON