

Herbert Sander Gutowsky – An obituary

Herbert (Herb) S. Gutowsky passed away on 13 January 2000 at the age of 80. Though he was suffering from Parkinson's disease and diabetes during the last few years, it rarely detracted him from his new love, namely rotational spectroscopy of weakly bound complexes and the last paper he submitted appeared on 15 January 2000! (ref. 1). Herb is well known among the NMR spectroscopists for his seminal contributions in that field.

Herb was born on 8 November 1919 at Bridgman, Michigan, USA. He obtained his AB degree in 1940 from Indiana University, and also a DSc degree in 1983. He had worked with K. S. Pitzer for an MS degree from the University of Berkeley and with G. B. Kistiakowsky for a Ph D (1949) from Harvard University. He joined the University of Illinois at Urbana-Champaign as an Instructor in 1948 and became a full Professor by 1955. It was during these years that his group discovered the importance of chemical shift and spin-spin coupling in NMR². One need not emphasize the importance of these discoveries. J. F. Nixon of University of Sussex, during his recent visit to Bangalore, mentioned to this author that Gutowsky was considered the father of NMR spectroscopy among chemists! The discovery of scalar coupling is an interesting story². On 8 September 1950 Charlie Hoffman (Herb's first Ph D student) observed a doublet for F resonance in a sample of PF₃. As is true with many new discoveries, they suspected impurities in the sample of PF₃ which was prepared by fluoridation of PCl₃. Naturally PF₂Cl and PFCl₂ were the 'obvious' impurities. Hoffman purified the sample several times and prepared it using another method but the second line just would not go away! PF₅ gave a doublet as well which was attributed to the difference in equatorial and axial positions. A new student, Dave McCall, looked at the ³¹P resonance in POCl₂F which was a doublet too. Gutowsky realized what was happening. Next McCall looked at the ³¹P resonance in CH₃OPF₂ and observed the 1-2-1 triplet exactly as predicted by Gutowsky. I was surprised to learn that the chemical shift and spin-spin coupling were observed first with heteroatoms such as ¹⁹F and ³¹P rather than with the common proton (¹H).

Gutowsky has won numerous awards and honours. He won the American Chemical Society awards for both Chemical Physics (Irving Langmuir Award) and Physical Chemistry (Peter Debye Award) in 1966 and 1975, respectively, the National Medal of Science (USA) in 1977 and the Wolf Prize in Chemistry (Israel) in 1984. He visited Mumbai in 1974 to receive the Award of the International Society of Magnetic Resonance. He also won the Pittsburgh Spectroscopy Award in 1992. More than these awards, I was impressed by an incident which I heard from Tryggvi Emilsson, Herb's long-time co-worker. In the early 1950s Varian was toying



with the idea of making a commercial NMR spectrometer. One of Varian's representatives attended an American Chemical Society meeting held in Chicago, where Herb was discussing the importance of chemical shifts and NMR as a structural tool. According to the representative, Herb's talk convinced Varian that they should build commercial NMR! Herb was the first to write a review on NMR spectroscopy for the *Annual Review of Physical Chemistry* in 1954 (ref. 3). In 1980, he wrote his third review for the same series². Herb began to lose interest in NMR within a few years. He felt nothing exciting (to him) was happening in NMR in the early 1980s. By then, he had served the Department of Chemistry and the School of Chemical Sciences in the University of Illinois at Urbana-Champaign in all capacities. He was the Head of the Department between 1967 and 1970 and in addition he

was the Director of the School of Chemical Sciences from 1970 to 1983. The year 1983 was a turning point in his career. That was the year he had to formally retire. His close friend and colleague, W. H. Flygare⁴ had passed away in 1981 at the untimely age of 45. Flygare had just recently built the pulsed nozzle Fourier transform microwave spectrometer to study the rotational spectra of weakly bound complexes. Herb changed his field (at the age of retirement) and started afresh. (Somewhat coincidentally he divorced his first wife of 32 years in 1981 and remarried in 1982. Both personally and professionally his life changed in the early eighties.) He continued as a Research Professor in the Department of Chemistry and also became a Professor at the Center for Advanced Study from 1983.

Herb's group became the first to look at the rotational spectrum of a weakly bound trimer⁵, tetramer⁶ and pentamer⁷. His group went on to make important contributions in this field as well, often resolving long-standing questions on systems such as the silicon-carbon double bond length⁸, and the structure of the benzene dimer⁹. On the silicon-carbon double bond, Herb's son Robb Gutowsky and coworkers had reported a length of 1.83(4) Å based on an electron diffraction study¹⁰. Schaefer's theoretical prediction for the same bond length was 1.692 Å (ref. 11). Eleven years after the electron diffraction work, Herb published his microwave results which confirmed the theoretical prediction⁸. His human touch was evident in the title he

chose for the paper 'Silicon-carbon double bond: Theory takes a round'.

Herb was a very nice person to work with. He was very proud and enthusiastic about doing science literally until his last breath. He transmitted this enthusiasm to all his coworkers. In one of his communications to a professional colleague he had written 'I like to think Bill (Flygare) would have been excited by what we were doing'. I have no doubt about that in my mind. May be Herb would have met Bill in Heaven, should there be one for accomplished scientists, and clarified it for himself!

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