Zeitschrift: Helvetica Physica Acta
Band: 58 (1985)
Heft: 6

Artikel: To Ernst Miescher, on his eightieth birthday
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DOI: https://doi.org/10.5169/seals-115627

Helvetica Physica Acta, Vol. **58** (1985) 951–955 0018–0238/85/060951–05$1.50 + 0.20/0

To Ernst Miescher, on his eightieth birthday

By G. Herzberg

On October 6, 1985, Ernst Miescher celebrates his eightieth birthday. On this occasion it behoves his friends and colleagues to acknowledge the debt they owe him for his many basic contributions to molecular physics.

In the same institute in which the two Hagenbachs (father and son) made significant contributions to early spectroscopy and where J. J. Balmer was stimulated to find his famous formula, Miescher began his studies and, not surprisingly, turned to spectroscopy for his life's work. After early work on the halides of B, Al, In and Tl, partly in collaboration with his friend and colleague, M. Wehrli, soon after the last war, he turned his attention almost exclusively to the NO molecule, obtaining a rich harvest of new information not only about NO but about diatomic molecules in general. In the history of spectroscopy there is, I believe, no one who has concentrated with such persistence and singleness of purpose for much of his scientific life on one molecule.

Miescher's involvement with the spectrum of NO began in about 1950 when, working in the vacuum ultraviolet region, he discovered what is now known as the β' system of NO.

It is to the credit of E. Miescher that he was the first to recognize the fundamental significance of the widespread perturbations in the absorption and emission spectra of NO that arise from extensive interactions between the molecular electronic states. They represent the first detailed and comprehensive evidence for the quantum-mechanically required *avoided* crossing of two potential curves. Miescher succeeded – initially in collaboration with A. Lagerqvist – in giving a detailed quantitative account of the observations. His approach was to 'deperturb' the spectrum, an expression derived from the German word 'entstören' that since has become familiar to all spectroscopists, and in the process Miescher produced a masterful analysis of the very complicated spectrum of NO in the vacuum ultraviolet region.

After many years of patient, persistent, and imaginative work the emphasis gradually shifted to the study of the system of Rydberg states associated with the ground state of the ion NO^+. Although nitric oxide is a molecule with a single electron outside closed shells, not unlike the alkali atoms, the interpretation in terms of $s, p, d, \ldots$ series is not *a priori* a meaningful concept for the classification of its Rydberg states. In his deductions Miescher is always guided by his careful observations, and this led to a very fruitful exchange of ideas with R. S. Mulliken whose famous series of papers on molecular Rydberg states dates from the same years when significant progress was made in Miescher's laboratory. The work was rounded off a few years ago with the identification by Miescher and two of his former students, K. Dressler and Ch. Jungen, of the near atomic transition $5g$–$4f$ between high orbital angular momentum states of NO observed in the infrared emission from hot air.

It was natural that Miescher discovered and later rotationally analysed the spectrum of the NO^+ ion which confirmed the assumption that the ion, i.e. the core of NO, is N_2-like: its internuclear distance in the ground state is smaller, its vibrational frequency and dissociation energy substantially larger than that of NO.

In the course of his work, Miescher was able to interest many scientists throughout the world in the problems in which he was interested. He had early and close contacts with the Liège group: B. Rosen, P. Swings and M. Migeotte; with R. F. Barrow in Oxford and A. Lagerqvist in Stockholm; with our group in Ottawa where he visited many times and made use of the spectroscopic equipment; with H. P. Broida and R. W. Field at Santa Barbara where he studied the infrared NO laser; with the Orsay group, Mme Lefebvre-Brion, Mme. Gauyacq and his former student Ch. Jungen; and even with DESY in Hamburg where he made use of the facilities of HASYLAB under Koch. Whenever a problem in connection with NO comes up, the people involved get in touch with Miescher either by mail or by visits in Basel.

During his nearly 50 years as a professor at the University of Basel, Miescher had a long line of students whom he selected and taught most carefully. Much of their work, although published under their own names, testifies of the strong guidance, much needed criticism, and constant encouragement given them by Miescher on the long way towards completion of their Ph.D. theses. Several of Miescher's students have developed into distinguished scientists in their own right.

In 1951 Miescher organized an international spectroscopy meeting in Basel that was very successful (one of the forerunners of the European Molecular Spectroscopy Conferences which are still taking place every two years). It was here that Miescher gave his first lecture about NO (the discovery of the β' system mentioned earlier). An important further activity for the benefit of the spectroscopic community was Miescher's contribution as member of the Editorial Board and co-author to the Rosen Tables of Diatomic Molecular Spectra, both the first and the second edition.

In November 1970 Miescher became the recipient of the ninth Wissenschaftspreis of the city of Basel, a well deserved honour especially for one who has always been proud of his Basel heritage.

Miescher's immense contribution to molecular spectroscopy is recognized and admired by all serious workers in the field. By his devotion to the NO molecule he has led the way in many basic problems in our field: the study of Rydberg series, of perturbations and of uncoupling phenomena, particularly of the interaction of Rydberg and non-Rydberg states.

I believe that all spectroscopists join with me in extending to Ernst Miescher sincere congratulations on his 80th birthday and good wishes for his health and further success in the study of his molecule.

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(compiled by K. P. Huber)

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