

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

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

Nutzungsbedingungen

Die ETH-Bibliothek ist die Anbieterin der digitalisierten Zeitschriften. Sie besitzt keine Urheberrechte an den Zeitschriften und ist nicht verantwortlich für deren Inhalte. Die Rechte liegen in der Regel bei den Herausgebern beziehungsweise den externen Rechteinhabern. [Siehe Rechtliche Hinweise.](#)

Conditions d'utilisation

L'ETH Library est le fournisseur des revues numérisées. Elle ne détient aucun droit d'auteur sur les revues et n'est pas responsable de leur contenu. En règle générale, les droits sont détenus par les éditeurs ou les détenteurs de droits externes. [Voir Informations légales.](#)

Terms of use

The ETH Library is the provider of the digitised journals. It does not own any copyrights to the journals and is not responsible for their content. The rights usually lie with the publishers or the external rights holders. [See Legal notice.](#)

Download PDF: 01.04.2025

ETH-Bibliothek Zürich, E-Periodica, <https://www.e-periodica.ch>

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, . . .* 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.

BIBLIOGRAPHY OF PUBLICATIONS BY ERNST MIESCHER

(compiled by K. P. Huber)

1. *Beitrag zur Kenntnis der anomalen magnetischen Rotationsdispersion von Lösungen.* Helv. Phys. Acta 3, 93–133 (1930).
2. *Dispersionmessungen der magnetischen Drehung im Ultraviolett.* Helv. Phys. Acta 4, 398–408 (1931).
3. *Zur optischen Mengenbestimmung photochemischer Reaktionsprodukte.* Nachr. Ges. Wiss. Göttingen, Math.-Phys. Klasse No. 3, 329–334 (1933).

4. *Bandenspektren des Indiumchlorids*. With M. Wehrli. *Helv. Phys. Acta* 6, 256–259 (1933).
5. *Die Spektren der Indiumhalogenide*. With M. Wehrli. *Helv. Phys. Acta* 6, 457–458 (1933).
6. *Die Spektren der Galliumhalogenide*. With M. Wehrli. *Helv. Phys. Acta* 6, 458–459 (1933).
7. *Ein neues Bandenspektrum des Schwefels im Schumanngebiet*. With K. Wieland and M. Wehrli. *Helv. Phys. Acta* 6, 460 (1933).
8. *Spektroskopische Untersuchung dampfförmiger Indiumhalogenide*. With M. Wehrli. *Helv. Phys. Acta* 7, 298–330 (1934).
9. *Spektroskopische Untersuchung dampfförmiger Galliumhalogenide; mit einem Anhang über ein Spektrum des Galliumoxyds*. With M. Wehrli. *Helv. Phys. Acta* 7, 331–359 (1934).
10. *Molekülspektren von Bor- und Aluminiumhalogeniden*. *Helv. Phys. Acta* 7, 462–464 (1934).
11. *Ein neues Absorptionsspektrum von zweiatomarem Schwefeldampf im Schumanngebiet*. With K. Wieland and M. Wehrli. *Helv. Phys. Acta* 7, 843–849 (1934).
12. *Bemerkung zur Arbeit von A. Petrikaln und J. Hochberg: Die Molekularspektren einiger Indium- und Gallium-Halogenide*. With M. Wehrli. *Z. Phys.* 87, 310–311 (1934).
13. *Bandenspektren von Bor- und Aluminium-Halogeniden*. *Helv. Phys. Acta* 8, 279–308 (1935).
14. *Absorptionsspektren und Lebensdauer chemisch instabiler zweiatomiger Moleküle (BBr, AlBr, AlJ)*. *Helv. Phys. Acta* 8, 486–487 (1935).
15. *SiBr Banden*. *Helv. Phys. Acta* 8, 587–588 (1935).
16. *Absorptionsspektren und Lebensdauer zweiatomarer Moleküle mit freien Valenzen*. *Helv. Phys. Acta* 9, 693–706 (1936).
17. *Condensation coefficients of mercury halides*. With F. Metzger. *Nature* 142, 572 (1938).
18. *Molekülspektren von Halogeniden der Eisengruppe, insbesondere FeCl*. *Helv. Phys. Acta* 11, 463–468 (1938); *Verh. Schweizer. Naturf. Ges.* (1938), 114.
19. *Zum Molekülspektrum von TiCl*. *Helv. Phys. Acta* 12, 296–297 (1939).
20. *Schweres Chlor (Clusius) im Bandenspektrum von TiCl*. *Verh. Schweizer. Naturf. Ges.* (1939), 20.
21. *Rotational analysis of the spectrum of boron bromide*. With E. Rosenthaler. *Nature* 145, 624 (1940).
22. *Bandenspektren von Thalliumchlorid*. *Helv. Phys. Acta* 14, 148–162 (1941).
23. *Zum Elementarprozess der Verdampfung*. *Helv. Phys. Acta* 14, 320–321 (1941).
24. *Über eine Methode zur Bestimmung des Molekulargewichts verdampfender Teilchen*. *Helv. Phys. Acta* 14, 507–515 (1941).
25. *Terme hoher Multiplizität in Molekülspektren*. With W. Müller. *Helv. Phys. Acta* 15, 319–320 (1942).
26. *Über eine Methode zur Messung zeitlich rasch veränderlicher Spektren*. With D. Maeder. *Helv. Phys. Acta* 15, 511–513 (1942).
27. *Molekularzustände bei der freien Verdampfung*. With F. Metzger. *Helv. Phys. Acta* 16, 205–206 (1943); *Chem. Zentralblatt* (1944), 1362.
28. *Verdampfungsgeschwindigkeit von Eis*. With K. Tschudin. *Helv. Phys. Acta* 18, 456–457 (1945).
29. *Komplexspektren der Manganhalogenide*. With J. Bacher. *Helv. Phys. Acta* 20, 245–247 (1947).
30. *Spectres de bande de haute multiplicité*. *J. Phys. Radium* 9, 153–155 (1948).
31. *Absorption band spectrum of S₂ in the Schumann region*. With R. Maeder. *Nature* 161, 393 (1948).
32. *New electronic band-systems of diatomic boron compounds (BF, BO, and BH)*. With M. Chrétien. *Nature* 163, 996–997 (1949).
33. *Bandenspektren von Borfluorid (BF) im Schumanngebiet*. With M. Chrétien. *Helv. Phys. Acta* 22, 588–590 (1949).
34. *Ein neues Bandensystem des NO-Moleküls*. With P. Baer. *Helv. Phys. Acta* 24, 331–333 (1951).
35. *Band spectra in the Schumann region of NO and N₂⁺ with enriched nitrogen-15*. With P. Baer. *Nature* 169, 581 (1952).
36. *Etudes des spectres de bandes de N₂⁺, NO et NO⁺ dans la région de Schumann à l'aide de N¹⁵*. *Mém. Soc. R. Sci. Liège* 13, 137–140 (1953).
37. *NO-, NO⁺- und N₂⁺-Emissionsspektren im Schumanngebiet*. With P. Baer. *Helv. Phys. Acta* 26, 91–110 (1953).
38. *Spettri di assorbimento di composti eterociclici.—V. Gli spettri di assorbimento del selenofene e del N-metilpirrolo nella regione di Schumann*. With G. Milazzo. *Gazz. Chim. Ital.* 83, 782–786 (1953).
39. *Spectres d'absorption du sélénophène et du N-méthylpyrrole dans la région de Schumann*. With G. Milazzo. *J. Phys. Radium* 15, 401–402 (1954).
40. *Spectroscopic identification of diatomic PS and new band systems of PO and P₂*. With K. Dressler. *Proc. Phys. Soc. (London) A* 68, 542–544 (1955).
41. *Fine structure of NO⁺ and NO emission spectra in the Schumann region*. *Can. J. Phys.* 33, 355–356 (1955).

42. *Rotationsanalyse der NO⁺-Banden.* Helv. Phys. Acta 29, 135–144 (1956).
43. *Rotationsanalyse der β' Banden ($B'^2\Delta-X^2\Pi$) des NO Moleküls.* Helv. Phys. Acta 29, 401–409 (1956).
44. *Fine structure analysis and mutual perturbation of the δ and β bands of the NO molecule.* With G. Herzberg and A. Lagerqvist. Can. J. Phys. 34, 622–624 (1956).
45. *Fine structure analysis of NO absorption bands in the Schumann region.* With R. F. Barrow. Proc. Phys. Soc. (London) A 70, 219–222 (1957).
46. *Absorptionsspektrum des NO-Moleküls. Feinstruktur-Analyse der δ - und β -Banden und homogene Störung $C^2\Pi-B^2\Pi$.* With A. Lagerqvist. Helv. Phys. Acta 31, 221–262 (1958).
47. *Balmers Namen in der Physik der Gegenwart.* Verhandl. Naturf. Ges. Basel 72, 369–370 (1961).
48. *Absorption spectrum of the NO molecule. II. New fine-structure analyses below 1600 Å.* With A. Lagerqvist. Can. J. Phys. 40, 352–357 (1962).
49. *Spectrum and energy levels of the NO molecule.* J. Quant. Spectrosc. Radiat. Transfer 2, 421–425 (1962).
50. *Absorption spectrum of the NO molecule. III. The heterogeneous perturbation $H^2\Sigma^+-H'^2\Pi$.* With K. P. Huber. Helv. Phys. Acta 36, 257–268 (1963).
51. *Rydberg series of the NO molecule in the visible and infrared emission spectrum.* With K. P. Huber and M. Huber. Phys. Lett. 3, 315–316 (1963).
52. *Absorption spectrum of the NO molecule. IV. The $G^2\Sigma^- - X^2\Pi$ system.* With A. Lofthus. Can. J. Phys. 42, 848–859 (1964).
53. *Absorption spectrum of the NO molecule. V. Survey of excited states and their interactions.* With K. Dressler. Astrophys. J. 141, 1266–1283 (1965).
54. *The emission spectrum of the NO molecule in the vacuum ultraviolet, 1600–1400 Å.* With Ch. Jungen. Astrophys. J. 142, 1660–1661 (1965).
55. *Absorption spectrum of the NO molecule. VI. Band structures below 1600 Å, Rydberg states $C^2\Pi, D^2\Sigma^+, K^2\Pi, M^2\Sigma^+, S^2\Sigma^+$, non-Rydberg states $B^2\Pi, L^2\Pi$, and their interactions.* With A. Lagerqvist. Can. J. Phys. 44, 1525–1539 (1966).
56. *Absorption spectrum of the NO molecule. VII. Extension of the Rydberg series of ns, np, nd, and nf . . . complexes.* J. Mol. Spectrosc. 20, 130–140 (1966).
57. *Level crossings $C^2\Pi \sim B^2\Pi$ and $F^2\Delta \sim B'^2\Delta$ and the laser combination transition $B'^2\Delta - C^2\Pi$ of the NO-molecule.* With Ch. Jungen and R. Suter. Phys. Lett. 21, 36–37 (1966).
58. *Absorption spectrum of the NO molecule. VIII. The heterogeneous ($^2\Sigma^- - ^2\Pi$) interactions between excited states.* With Ch. Jungen. Can. J. Phys. 46, 987–1003 (1968).
59. *Spin-orbit coupling in molecular Rydberg states of the nitric oxide molecule.* With F. Ackermann. Chem. Phys. Lett. 2, 351–352 (1968).
60. *Absorption spectrum of the NO molecule. IX. The structure of the f complexes, the ionization potential of NO, and the quadrupole moment of NO⁺.* With Ch. Jungen. Can. J. Phys. 47, 1769–1787 (1969).
61. *High resolution study of the $C^2\Pi - X^2\Pi$ emission bands of the NO molecule.* With F. Ackermann. J. Mol. Spectrosc. 31, 400–405 (1969).
62. *Absorption spectrum of the NO molecule. X. The 3d Rydberg complex, its vibrational structure, spin-orbit coupling, and interactions with non-Rydberg states.* Can. J. Phys. 49, 2350–2365 (1971).
63. *Near-infrared $^2\Delta - ^2\Pi$ nitric oxide laser with predissociated lower state.* With H. P. Broida. IEEE J. Quantum Electron. 9, 1029–1030 (1973).
64. *The fine structure of the spectrum of the electronic NO laser.* J. Mol. Spectrosc. 53, 302–310 (1974).
65. *The Rydberg series of the NO molecule converging to the first ionization limit 1340 Å.* In "Vacuum Ultraviolet Radiation Physics", Proc. IV Intern. Conf. on Vacuum UV Rad. Phys. (edited by E. E. Koch, R. Haensel, and C. Kunz), Pergamon-Vieweg (1974), p. 61–63.
66. *Observed and calculated interactions between valence states of the NO molecule.* With R. W. Field and R. A. Gottscho. J. Mol. Spectrosc. 58, 394–413 (1975).
67. *Electronic spectrum of the NO molecule.* With K. P. Huber. International Review of Science, Physical Chemistry Series Two, Vol. 3 Spectroscopy (edited by D. A. Ramsay), Butterworths (1976), p. 37–73.
68. *Atlas of the absorption spectrum of nitric oxide (NO) between 1420 and 1250 Å.* With F. Alberti. J. Phys. Chem. Ref. Data 5, 309–317 (1976).
69. *High resolution absorption spectrum of nitric oxide (NO) in the region of the first ionization limit.* Can. J. Phys. 54, 2074–2092 (1976).
70. *The $I^2\Sigma^+$ state of the NO molecule.* J. Mol. Spectrosc. 69, 281–293 (1978).
71. *Autoionization structure of nitric oxide (NO) at the first ionization limit.* With Y. T. Lee and P. Gürtler. J. Chem. Phys. 68, 2753–2756 (1978).

72. *Quartet-doublet interactions observed in the emission spectrum of the NO molecule.* J. Chem. Phys. 73, 3088–3094 (1980).
73. *Higher resolution photoionization study of NO near the threshold.* With Y. Ono, S. H. Linn, H. F. Prest, and C. Y. Ng. J. Chem. Phys. 73, 4855–4861 (1980).
74. *Identification of the 5g–4f Rydberg–Rydberg transition of the NO molecule.* With K. Dressler and Ch. Jungen. J. Phys. B 14, L701–L704 (1981).
75. *On highly excited electronic states of the NO molecule reached by multiphoton spectroscopy.* With K. Dressler. J. Chem. Phys. 75, 4310–4316 (1981).