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RICHARD WILLSTÄTTER

August 13, 1872–August 3, 1942

Richard Willstätter, honorary member of the American Chemical Society, died in Switzerland on August 3. He would have been seventy years of age on August 13, at which time his former students and colleagues all over the world were planning to send him felicitations. He had been seriously ill during the last winter but, in spite of his poor physical health, his mind remained as clear and as active as formerly.

Dr. Willstätter was born in Karlsruhe, Germany. He studied chemistry under Adolf von Baeyer in Munich and even in his student days was recognized by his great teacher as a genius. This was clearly demonstrated when, after two years as a privat-dozent at Munich and at the youthful age of twenty-six, he clarified the structure of tropine, atropine and cocaine, and at twenty-nine synthesized tropine, tropilidene and tropane. In 1902 he became professor (extraordentlich) of organic chemistry at Munich to fill the position held by Johann Thiele. Three years later he was called to the Technische Hochschule in Zürich as professor and successor to Eugene Bamberger. He left Zürich in 1912 and for four years was director of the Kaiser Wilhelm Institute in Berlin. Upon the death of von Baeyer in 1916, Willstätter was selected as director of the chemical laboratories at Munich and as professor of organic chemistry to replace his former teacher. Because of the anti-Semitic policy of the University he resigned in 1925 and thereafter continued researches with a few collaborators in his own private laboratory. Since 1939, he had lived in Locarno-Muralto in southern Switzerland.

The accomplishments of Willstätter are those of a great scientist. Although his major interest through life was research on natural products, he made equally significant contributions in a wide variety of fields in organic chemistry. Following his brilliant work on cocaine and atropine, he began the study of chlorophyll, which subsequently led to the isolation and purification of this important product. His ingenious technique and clever experimentation did much toward establishing the character of the molecule and the results served as the foundation for all subsequent investigations on this and related subjects. The pigments in fruits, in the petals of flowers and in plants presented a broad field of research from which emerged the structures of these natural dyes. His experiments on the degradation of cellulose to lower carbohydrates, especially glucose, were used by others as the basis of a practical method for obtaining dextrose. His research activity in later years was concentrated on the study of enzymes and of fermentation. He brought new light into these fields where others had failed. Every experienced organic chemist is familiar with Willstätter's studies on catalytic hydrogenation and oxidation, quinones, ring compounds, aniline black and of synthetic compounds of pharmaceutical significance.

Characteristic of the man was his concentration upon the most important and most difficult problems which came to his attention. The easier problems were left to others. He did not know discouragement and by his ability, coupled with persistence, he contributed in a major way to any subject he explored.

Honors came to him from every land. He was awarded the Nobel prize in chemistry in 1915 for his researches on chlorophyll and other plant products; the Davy Medal of the Royal Society of London in 1932; the Willard Gibbs Medal of the Chicago Section of the American Chemical Society in 1933. He was an honorary member of the German, British and American Chemical Societies, and a member of more than a dozen Academies of Science in different countries.

Richard Willstätter was an indefatigable worker and a great teacher who inspired his students and collaborators and kindled their enthusiasm. His stimulation has left a lasting impression on all those fortunate enough to have worked with him.

In spite of the many sorrows that entered his life in the early loss of his wife and only son, and later in the loss of all his possessions and in his forced exile from Germany, his personal troubles did not dim his interest or his leadership in the progress of organic chemistry. His former students owe him much. The world of science is indebted to him for his contributions and mourns the passing of this inspiring and brilliant scientist.

ROGER ADAMS

[CONTRIBUTION FROM THE AMMONIA DEPARTMENT OF E. I. DU PONT DE NEMOURS AND COMPANY, INC.]

Optical Crystallographic Studies with the Polarizing Microscope. V. Ellipsoidal Dispersion in the Picrates of Various Amines

BY J. MITCHELL, JR., AND W. M. D. BRYANT

The systematic application of the various types of dispersion and other optical properties to the identification of amines in the form of their picric acid salts follows directly upon the ground work of dispersion measurement outlined in two preceding papers of this series.[1] The picrates have long been favorite derivatives for the characterization of nitrogen bases through their melting points, but due to the large number of possible derivatives involved, additional more specific physical criteria are desirable. The great sensitivity of optic axial angle and the optical ellipsoid axes to changes in the wave length of light in this series makes ellipsoidal dispersion a powerful and discriminating tool.

The present study covers picric acid and the picrates of thirty-two bases, including ammonia and nineteen lower members of the aliphatic monoamine series; the remaining thirteen are derivatives of polyamines, hydroxylated amines and cyclic bases. Four of the salts occur in two distinct modifications and a fifth occurs in three modifications. The six high temperature forms (designated as II or III) are in each case obtained from the melt. This brings to thirty-nine the number of distinct crystal species covered in this research.

Measurable dispersion of the optic axes was present in all of the compounds studied. Six showed no other type of dispersion. There were thirteen examples of crossed axial plane dispersion, four of axial dispersion with change of sign, three of inclined dispersion, two of horizontal dispersion and fifteen examples of crossed dispersion. Many of the materials exhibited more than one type of dispersion. No examples of triclinic dispersion could be recognized in this group of compounds. Of the substances investigated only picric acid and its ammonium salt appear to have been the subject of earlier optical studies.[2] Attention was given to the "red modification" of ammonium picrate discussed by Davis[3] in order to establish its relationship to the usual yellow form.

Extension of the spectral range of the optical equipment into the near infrared by photographic means proved feasible and this expedient was used to advantage in studying three of the derivatives.

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[1] (a) Bryant, THIS JOURNAL, 63, 511 (1941); (b) Paper IV, *ibid.*, 65, 96 (1943). The term *ellipsoidal dispersion* is used in preference to *selective dispersion* employed in 1a in the same connection.

[2] Groth, "Chemische Krystallographie," W. Engelmann, Berlin, 1917, Vol. IV, pp. 116–119.

[3] Davis, "The Chemistry of Powder and Explosives," Vol. I, John Wiley and Sons, Inc., New York, N. Y., 1941, pp. 167–168.